THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVII. No. 1456.] LONDON, APRIL 7, 1891. [43RD YEAR. Price 6d.

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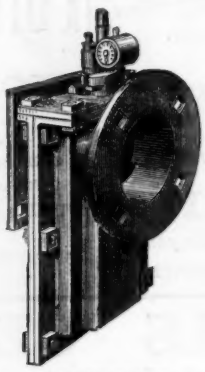

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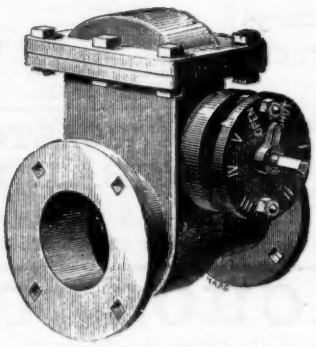

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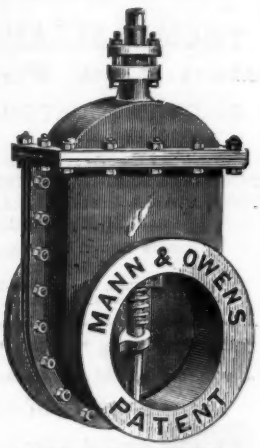

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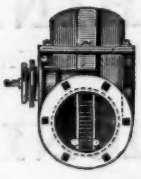

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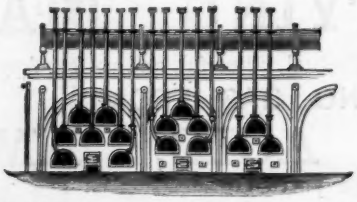

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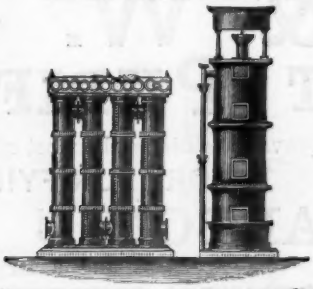

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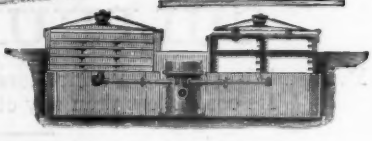

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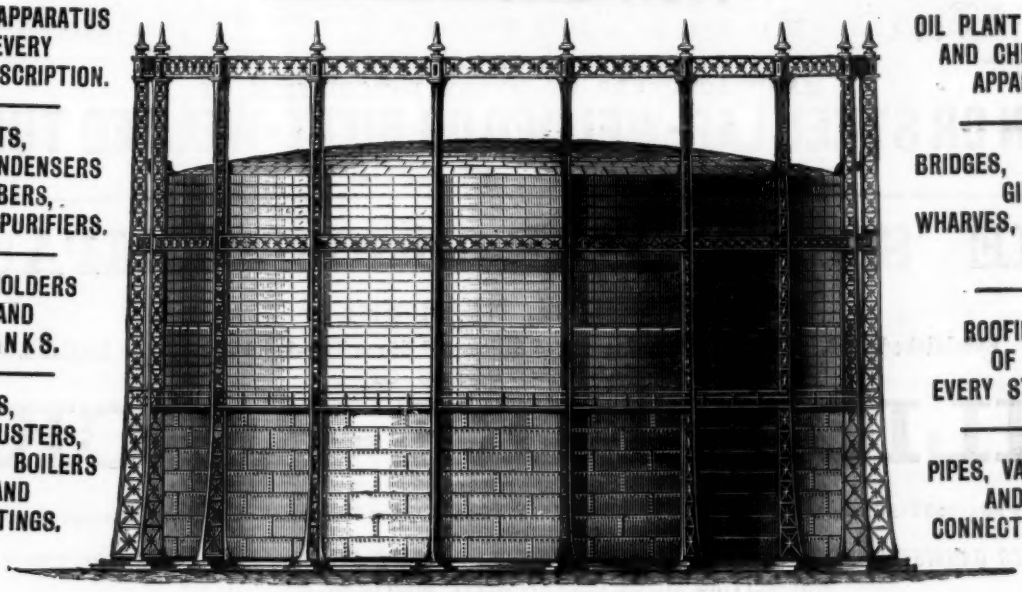

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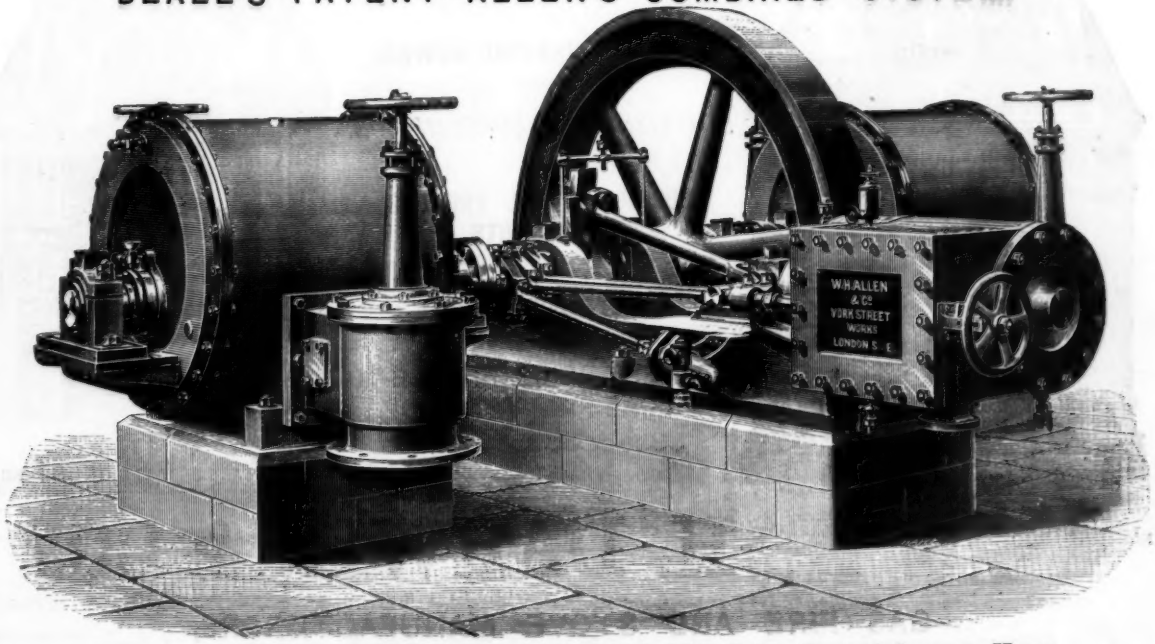

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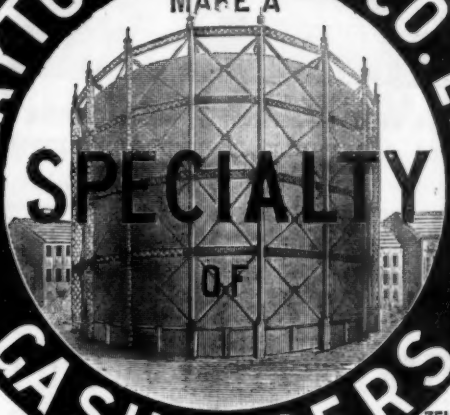

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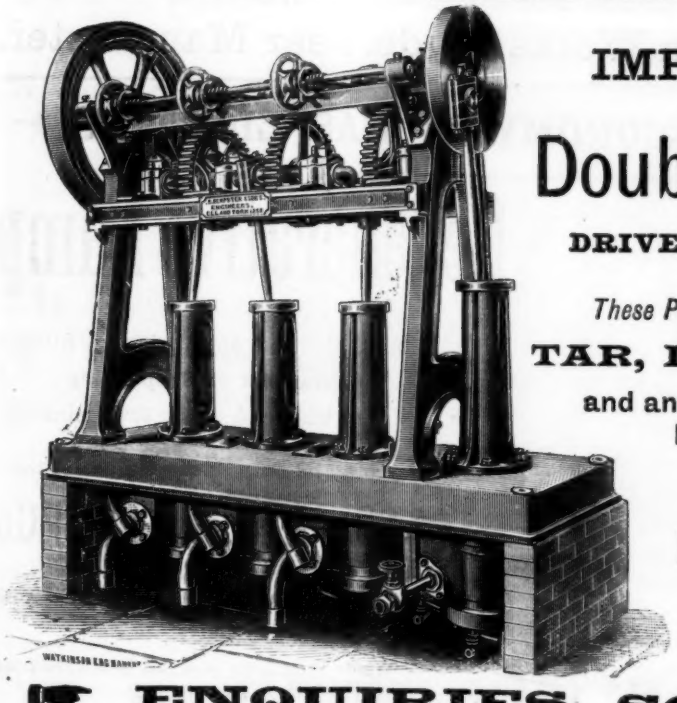

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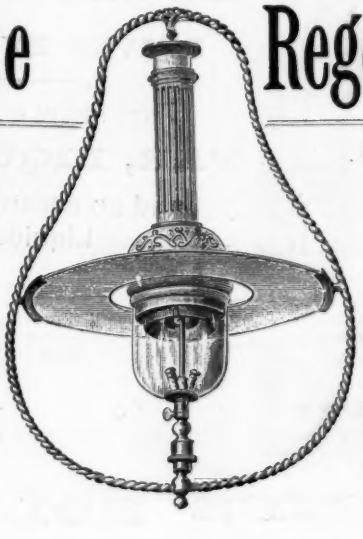

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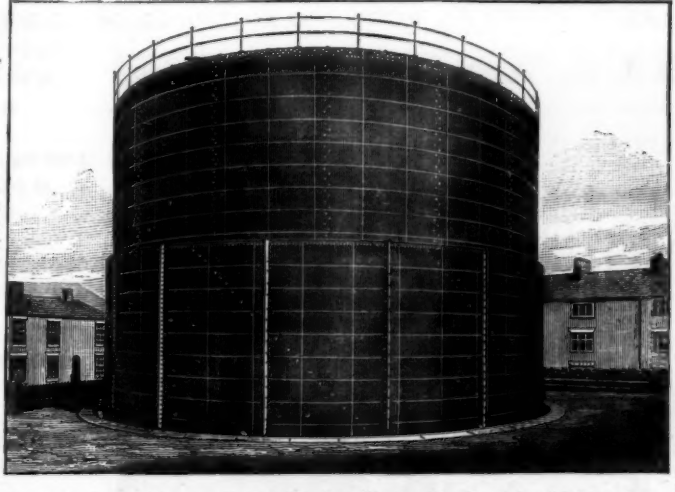

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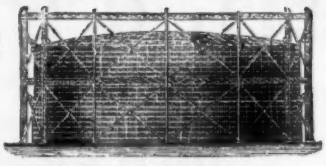

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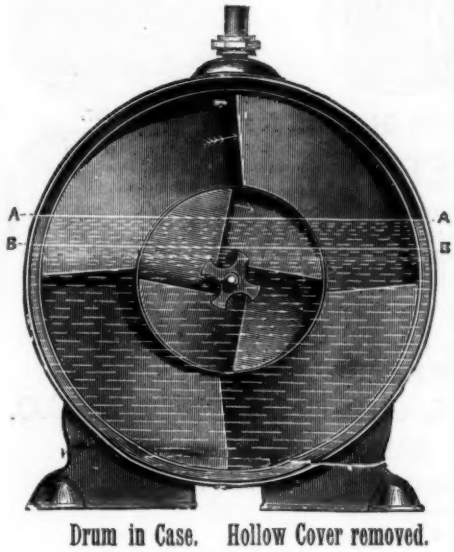
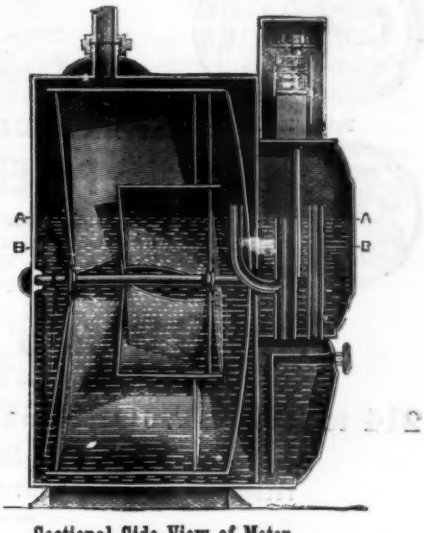
THE WARNER AND COWAN METER.



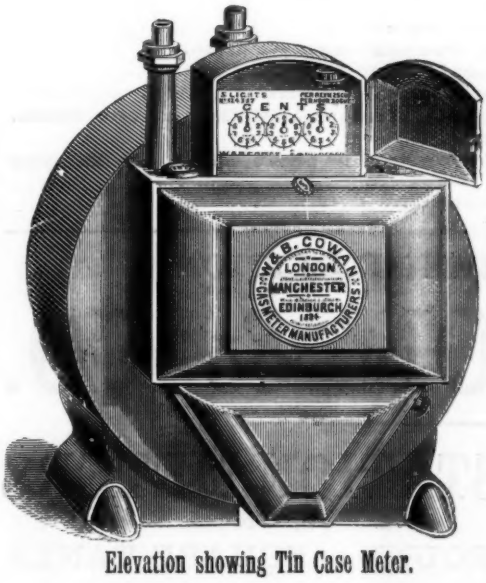
A A, High-Water Line.

B B, Low-Water Line.

Drum in Case. Hollow Cover removed.



Sectional Side View of Meter.



Elevation showing Tin Case Meter.

Elevation showing Cast-Iron Case Meter.

In its completeness as a measure, the WARNER AND COWAN drum differs from every other. Of definite capacity, irrespective of the water-line, it can neither be over nor under filled, but discharges at each revolution the same volume of gas.

It is to this also that its secondary, though important, advantage is due—viz., the long float-range which this drum permits.

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The drum being of fixed capacity within itself, the extraneous mechanism and arrangements are of the most simple character. These include all that is necessary, but exclude all that would be superfluous.

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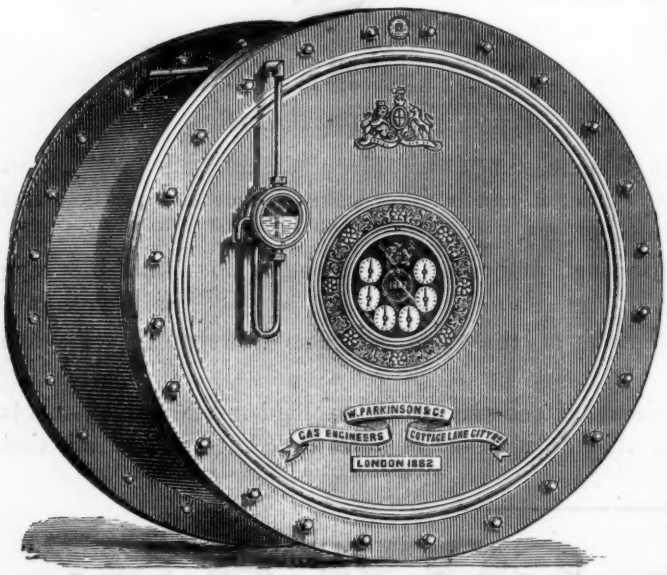

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[See also Advt. p. 672.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE
JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 7, 1891.

The Affairs of the Commercial Gas Company.

THE general meeting of the Commercial Gas Company was held on Friday last—the Chairman of the Board of Directors (Mr. John Blacket Gill) presiding. Our usual report of the proceedings will be found in another column. These were not particularly interesting, even as Gas Companies' meetings go, although, in the course of the talk across the table, one or two topics cropped up which are not without some weight as points of gas politics. The most noteworthy of these was the reference to the decision of the Board to issue additional capital, which step derives its principal significance from the circumstances of the Company. Upon the face of it, there is little to attract attention in the simple fact that a London Gas Company, having had for years an overdrawn capital account, find themselves compelled to raise £35,000 by the issue of fresh stock, to be followed by an increase of debenture capital to an equal amount. When it is remembered, however, that the Company in question is the only sliding-scale undertaking in the kingdom which has the privilege of raising capital without selling its new stock or shares by auction, it at once becomes a matter for curious inquiry as to how so unique an arrangement has worked. It would be doing less than justice to the Directors and professional advisers of the Commercial Company to refrain from acknowledging, in the fullest manner possible, that in their hands it has unquestionably worked conspicuously well. This is not a small matter, nor a piece of evidence that can be overlooked when systems of gas administration are being discussed. Here, it may be said, is the case of a Gas Company who, by an accident of time and circumstance, obtained the sliding scale with a high initial price, whereby they have been enabled to increase their rates of dividend upon the old and new stock from 10 and 7 per cent. to 13¾ and 10¾ per cent. respectively. With this advantage, they have possessed the privilege of issuing fresh capital at par to the old proprietors—which means, of course, putting heavy premiums into their pockets. Every £100 of old stock issued to a proprietor could be sold beforehand in the market for £255, just as every £100 of new stock would command £200 upon offer. What, then, was the consequence of this unusual condition of affairs? Of course, says the public-spirited gentleman who cannot understand that Gas Companies are ever anything else but "grasping monopolists" who must be perpetually harassed lest they should sell the worst gas at the highest price, and pay larger dividends than the law permits—the Company kept on issuing fresh capital, and enriching directors and shareholders at the expense of the public, until they had loaded the undertaking to the breaking-down point. This is the practical common-sense view which would naturally occur to the practical business men, who can never see an inch beyond their noses, who constitute the wisdom of local governing bodies. Well, it so happens that the facts are altogether different; the Commercial Directors, with this temptation constantly present to them, having worked for years with a closed capital account, until they have brought the burden of capital invested per ton of coal carbonized down to the lowest of all similar concerns in the kingdom. Moreover, as Mr. H. E. Jones, the Engineer and General Manager, told the meeting on Friday, although the rate of dividend has gone up, the amount required to pay this dividend is considerably less per 1000 cubic feet of gas sold than was needed to pay the old maximum dividends.

These are truths that may be commended to the study of critics of gas administration systems everywhere, from the parochial wiseacres of our own country to the scientific gentlemen of Paris and elsewhere, who cannot discover any reason, in the processes of gas manufacture, for selling the product cheaper now than half-a-century ago. We do not claim for the Directors of the Commercial Company any superiority of virtue in what they have done. They would be the first to repudiate the notion that any but sound financial and trade reasons have governed their policy. Neither in the East of London nor anywhere else is gas supply a philanthropic enterprise. To sell gas as cheaply as possible, and with this view to keep down the capital account, is purely a point of prudent gas management. All that the Commercial Board have done is simply to avoid killing the goose that lays golden eggs for them. If we can conceive, for the sake of illustration, the controlling power in the Company as having been captured by a piratical gang of speculators, we shall see how these raiders might have found it worth while to issue all the capital they could, pocket the premiums, and then abandon the concern to its fate. Not as such are the Commercial Board. The Directors personally represent a great proportion of the capital, and therefore would have had in the long run to bear the brunt of inflated stocks. This example serves

to show how, in the circumstances of the Company, the security of the undertaking has depended upon the commitment of the Board to the permanent interest of the concern, and their consequent superiority to the temptation of bagging premiums. The case is, of course, altered in auction-clause Companies.

The example of the Commercial administration is valuable as proving that the one fundamental guarantee for cheap gas supply and for the prosperity of the gas industry, as these linked conditions are understood in the United Kingdom, is not maximum dividends, nor sliding scale, nor auction clauses, but the statutory protection afforded to a properly constituted Gas Company in the quiet possession and development of their district. Granted this datum, the business faculty of our capitalists and the skill of our professional men will be answerable for the rest. It is not to be drawn from these observations that we hold the opinion that the peculiar *status* enjoyed by the Commercial Company could be safely made universal. It is an anachronism that new capital required by a Company of this character should cost such a high rate to the whole undertaking; and this fact would be a very serious matter if the Commercial district were of a more expansive order. If much new capital were required year by year, a different arrangement would have to be concluded for obtaining it. The Commercial Company could not afford to pay twice as much for extra capital as any other gas undertaking. As the case stands, however, nobody is appreciably hurt; for it goes without saying that the Board will not raise a shilling more than they think is absolutely needed. We are very far from assuming that all gas directors would be equally wise. A glance at the capital burdens of certain undertakings that might be named will show how in some places the present and future generations of gas consumers must suffer for the short-sighted rapacity of directors and shareholders of the bad old school.

The less pleasant topics for discussion that cropped up at the Commercial meeting were the troubles which the Company have had to bear in regard to their labour arrangements, and the condition of the revenue account. Mr. Gill, to whose ability as spokesman for a Board of Gas Directors we have borne witness on a previous occasion, managed to glide lightly over the latter difficulty; only hinting as it were quite incidentally, and after the report and accounts had been passed, that the financial statements for the current half year will not come out so well as those adopted by the meeting. He allowed it to appear, however, that the Board are waiting to see how the coal market stands during the summer before making any decided move in the direction of adjusting the revenue upon a fresh basis—in other words, raising the price of gas. The Board can very fairly permit themselves to take a further dip, if even a pretty heavy one, out of the undivided balance, upon the assumption that the rise in the price of coal is a temporary condition of the market. If they are driven to accept the conclusion that coal will be permanently dearer, this consideration and the enhanced cost of labour must be met in the inevitable, but unpleasant way. With respect to the question of labour, it is impossible to compliment the Commercial authorities upon the tale they told on Friday. We have not the remotest wish to say a word that may appear to aggravate the difficulty of the situation; but the story of the *Eastern Star*, so lugubriously narrated by Mr. Gill, and commented upon by Mr. H. E. Jones, tells clearly enough that during the past year the Company have been absolutely at the mercy of the Unions. The management thought best to take the line of waiting for the collapse of the bloated labour movement; but they did nothing to help the cause of liberty. Now it is probably hoped that matters will mend of themselves; but the cost of getting the Company's work done has swollen enormously; and it will be no easy task to cut it down.

Labour News.

The Gas Workers' and General Labourers' Union held the second anniversary of their organization at Barking last Sunday week, with the aid of other Unions representing unskilled labour; the assembly being estimated as numbering, including loafers, 30,000 people. Fifty-eight banners and ten bands were laid on for the purpose of heightening the glory of the proceedings, which included speech-making of the customary brand, supplied by members of the stock company who cultivate this particular line of business. According to the newspaper report, the meeting "concluded with cheers for the Gas "Workers' Union, the Cause of Labour, and an Eight-"Hour Day, led by Mr. John Burns." The season of the year has come for this sort of thing. So long ago as Chaucer's time, when Spring invited folks to outdoor amusements, they lost no excuse for going on pilgrimages. Similarly, in the spring-time the thoughts of the London loafer lightly turn to "demonstrating." He celebrated the Gas Workers last week; it may be the Amalgamated Blacking-Bottle Labellers next. It is all the same to him, so long as the demonstration fills up the dull hours during which the public-houses are debarred to him on a Sunday afternoon, and gives him something to talk over afterwards in his favourite tap-room. These outings have become an established Sunday entertainment which will not fail while the platform performers find their parts worth playing. The glad news that the great and good Mr. John Burns, who appears to have entirely forgiven Mr. W. Thorne for the uncomplimentary things this ex-stoker has said of him and his class, the "professional agitators," is at least no worse off in health, circumstances, or popularity for the failure of the strikes with which he has been recently connected, must be consolatory to his friends. It would never do for the "professional" striker to be compelled to share the fate of his clients when things do not turn out well. The qualifications of a successful practitioner of the art of labour agitation—who has taken the place of the extinct political agitator—are by no means easy to define. Mr. Burns has said himself that "a big voice" goes for much in this business; and it may also be considered as proved in his own case, as well as in others, that unbounded impudence in disregarding truth, reason, probability, and almost everything else that the world agrees to respect, is an equally necessary qualification. Your pattern Labour Agitator must also be able to ignore his own past failures as coolly as a sporting prophet, and promulgate the most glaring misrepresentations on the off-chance that he will not be compelled to prove his words. Thus, on the occasion under notice, Mr. Burns said that Mr. George Livesey had dropped his free labourers "like a hot "potato," although every man who heard him knew this was a lie without the prompt correction which Mr. Livesey himself has since sent to the newspapers. It is difficult to believe that the unskilled labourer, who is not altogether a fool when he takes the trouble to think for himself, always takes men like Mr. John Burns seriously. He sends for Burns occasionally, it is true, when he has got himself into a strike; but he does not ask his advice beforehand, and only calls him in as a self-rated expert in the moulding of public opinion and obtaining subscriptions. After all, one need not envy the agitator, who, like the priest of Nemi, must always go in dread of one stronger than himself who is to slay him and take his office, with its notoriety and its emoluments. By the way, another attempt has been made to create a true Labour newspaper—this one being entitled the *Trade Unionist*. The first number lies before us, and appears to closely follow the lines of the defunct *Labour Elector*. If it only keeps its labour news up to date, it ought to succeed in supplanting Mr. Michael Davitt's disappointing *Labour World*. The worst of these Labour journals is that they never know more about workmen's doings than can be more fully gleaned from the daily newspapers; and their editorials only differ from mob-oratory of the Burns kind in being duller to read, without being more truthful. It is small wonder, therefore, that the British workman after a while returns to the cheaper evening and Sunday sheets, which supply him with the racing tips and spicy police news that are so much more amusing than the wishy-washy Socialism which passes itself off for "Labour politics."

Development at Rochdale.

It will be seen by the report of the proceedings at the meeting of the Rochdale Town Council last Thursday which appears elsewhere, that the Gas Committee contemplate a large extension of their gas-works. The step is being taken not a day too soon. The town has grown considerably of late years, and its commercial development is not surpassed by any other Lancashire manufacturing town, unless it be that of its neighbour, Oldham. The Gas Committee have displayed a wisely progressive spirit in the past; and of late years they have pursued a

forward policy which has been attended by the best results. Acting upon the advice of Mr. T. Banbury Ball, their Engineer, they have been amongst the first to adopt inclined retorts and the oxygen process of purification. So far the results seem to have proved eminently satisfactory. But the time has come for a thorough enlargement of the works, such as will enable the Committee to meet the growing demand for gas during the next few years at least. A new retort-house—or rather the first section of one—is to be put up, and fitted with inclined retorts. There is also to be a new gasholder of a capacity of a million cubic feet, which will increase the storeage to about one day's maximum consumption. A new and larger exhauster, to take the place of the smaller of the two now in use, is also contemplated. More storeage space for tar and ammoniacal liquor is to be provided; in fact, extensions all round, except in the scrubbers, are in the programme. Means are also to be found for delivering the coal into shoots above the level of the retort-house floor, so as to avoid the cost of stacking. Altogether, the Rochdale Gas Committee have in their minds a large scheme of development, one effect of which will be to try the system of inclined retorts on a larger scale than heretofore. How far the "forward movement" may extend in other directions—in that of gasholder construction, for instance—the plans will determine when they are finished.

Differential Prices and One Meter.

YET another device for overcoming the initial difficulty of a system of differential prices for gas sold for lighting and cooking is that described in another column by Mr. E. U. G. Ernst, Engineer of the Aarhus (Denmark) Corporation Gas-Works, who deserves credit for the ingenious simplicity of the idea whereby he manages to measure gas consumed for different purposes, and charged at different prices, by the same meter. Aarhus is not a large place, and the conditions of life in it are probably easy to recognize. M. Ernst, upon inquiry, found that two years ago 400 families were consuming gas for lighting and cooking; and the question arose how to charge for the gas used for the latter purpose at a lower rate (as it was intended to do with a view to popularize gas cooking) without having recourse to two meters or even to meters with two indices. Reasoning the matter out, M. Ernst observed that he could safely regard practically all the gas consumed by a local household for the month of June as cooking gas. It follows that as the need for cooking is uniform throughout the year, twelve times the consumption for June represents roughly the family demand for cooking gas for the whole year—all the rest being lighting gas. When the bills for gas are made out monthly, according to the Continental custom, all that is necessary is to first take out the quantity corresponding to the June consumption, and price it at the cooking-gas rate, charging the rest at the lighting-gas rate. M. Ernst says that this system was adopted in Aarhus in June, 1889, and it has since then perfectly answered the expectations as to its promoters. He does not tell us what these were. That such a system works well, as a matter of administration, in a small country town where during June people go to bed at dusk, is not a matter for surprise. Having hit upon the happy thought, little trouble was to be feared in its execution by a prudent gas manager. The question as to the desirability of differential rates as a matter of principle is untouched by this communication, which moreover would have been more complete if it had contained figures showing how much additional gas the arrangement has been instrumental in selling, and what advantage the undertaking has derived therefrom.

Trouble for American Strikers.

WHEN commenting last week upon the outbreak of labour troubles in the Connellsville coke region of Pennsylvania, we did not imagine that our observations on the apparent failure of M'Kinleyism to make American employers and workmen happy, would be pointed in the way that last Friday's newspapers did for us, by announcing that the strikers and armed guards of the employers' property had had a desperate fight the day before, in which seven of the former were killed outright, and many more on both sides wounded. Evidently, the American "cokies" are not carrying on their strike with that regard to law and order which our English strikers exhibit—when it suits their purpose. One wonders what would have been said in England if a single shot had been fired in defence of property and the right of free labour during the late gas-works and dock strikes. Yet what has happened in Pennsylvania is only the local way of doing what the London police did in the South Metropolitan district with so tender a solicitude to avoid injuring even a hair of one of Thorne's interesting supporters. If the Unionists of this country ever for a single instant thought that in the Western Land of Liberty they would be granted permission to treat free labourers in a way more after their own will than the laws of this staid old country permit, this Pennsylvanian incident will show them their mistake. The vagaries that Police Magistrates punish here with a month's imprisonment are stopped in Free America with a bullet. Of course, we are informed that the Vice-President of the United Mine Workers, after "investigating" the circumstances of last Thursday's fatal riot at the Frick mines, declared that the guards' attack was unprovoked. "The strikers," he added, "were "simply marching in order to produce a moral effect on "the non-Unionists." Nobody is likely to misunderstand the kind of "moral effect" some hundreds of savage men, mostly armed, contemplated producing upon any non-Unionists unlucky enough to fall into their clutches; having previously, according to the report, cut the telegraph and telephone wires whereby the garrison of the threatened works might have summoned assistance. The last piece of intelligence connected with this incident that may be noted here is the fact that all the slain were imported labourers—two being Slavs, four Poles, and one an Italian. Thus works M'Kinleyism, fostering the creation and maintenance inside the Union of a grade of helots. It is impossible for a thoughtful American to look upon this state of things with serenity; and while he may well ponder the question whether it might not be better to allow his fine country to develop naturally, without such forcing as M'Kinleyism supplies, the labour agitator at home may be advised to take heed to the methods of Sovereign Democracy in dealing with a "moral effect" procession of Trade Unionists.

The Six-Lift Holder for the South Metropolitan Gas Company.—In the advertisement columns of the JOURNAL for the 3rd ult., the Directors of the South Metropolitan Gas Company invited tenders for the construction of a six-lift gasholder, of about 12 million cubic feet capacity, at their East Greenwich station. In response to the invitation, eleven tenders were sent in; the lowest of them being for £41,195, others rising by about £1000 to £45,000, then one for £50,000, and the remainder advancing successively by £1000 or thereabouts to £54,000. The contract has been placed with Messrs. Clayton, Son, and Co., Limited, of Leeds, who submitted the lowest tender; and they have undertaken to complete the work by Oct. 1, 1892. The total weight of metal in the holder will be about 2200 tons—1840 tons of wrought iron, 60 tons of cast iron, and 320 tons of steel. The cost of the holder works out to less than £3 10s. per 1000 cubic feet capacity; and that of the tank and holder together will not be much more than £4 10s.—certainly under £5—per 1000 cubic feet capacity.

Presentation to Mr. Burrows.—An interesting ceremony took place at the offices of the South Metropolitan Gas Company last Friday. On the occasion of the retirement of Mr. Burrows, the late Registrar, a very handsome silver salver and fish carvers were presented to him by his colleagues, together with a four o'clock tea service, of most artistic design in *repoussé* silver, for Miss Burrows. The Secretary (Mr. Frank Bush), in a neat speech, referred to the cordial relations that had existed between Mr. Burrows and his fellow-officers, and expressed the wishes of all present that his career in the future would be happy and prosperous. He then called upon Mr. Richard Trill, one of Mr. Burrows's oldest colleagues, to make the presentation. Mr. Trill said that, after an intimate association of more than a quarter of a century, they could not part without an expression of the regard felt for Mr. Burrows; and in presenting him with the objects before them, he hoped they would remind him in the future of the many happy days spent with his former colleagues, while the present for Miss Burrows would be an earnest to her of the high esteem in which her father was held by those who had known him for so many years. Mr. Burrows, in returning thanks, expressed the great regret that he felt in parting officially from those with whom it had been so pleasant to work. He testified to their ability and experience, which had been of great benefit to him; and he hoped that their friendly relations might continue—assuring them that the interest he had felt both in the Company and its officers in the past would not be diminished in the future. Among those present were Messrs. Frank Livesey, Braidwood, Howard, Holte, Coggin, Surman, and about fifty other gentlemen.

WATER AND SANITARY AFFAIRS.

REFERENCE was made in this part of our columns last week to some of the more general features of the scheme by which it is proposed to give a new and enlarged supply of water to Birmingham. So far as the contemplated source of the supply is concerned, the plan is twenty years old; Sir Robert Rawlinson having presented an elaborate report to the Corporation in 1871, recommending for this purpose that part of the watershed of Mid-Wales which is drained by the Rivers Elan and Claerwen, situated in the counties of Cardigan and Radnor. At that date the water-works were the property of a Company; but the Corporation, being zealous in the matter of the water supply, about five years later effected the purchase of the works. Instead of carrying out the grand and comprehensive project devised by Sir R. Rawlinson, they proceeded to develop and extend the system of which they had gained possession. Now at last they find themselves driven to such an extremity that, unless they do something more, the district will run short of water at the end of five or six years from the present time, if not sooner. Having obtained the professional advice of Mr. Mansergh, M. Inst. C.E., coupled with that of their own Water-Works Engineer (Mr. J. W. Gray), the Corporation have now before them not only the plan of Sir R. Rawlinson, but an enlargement of the project, so as to meet the present aspect of affairs; the estimated cost of the works being about £4,000,000. As a temporary alternative, they have also a plan worked out by Mr. Gray, whereby, for a capital outlay of nearly a million sterling, they could obtain a supply which would hold good for twenty years. But this is not considered a judicious mode of meeting the difficulty. This smaller scheme would consist in the construction of certain reservoirs for storing the flood waters of the Bourne. The water, after having had time to deposit the heavier material, would pass along the present channel of the stream to the existing reservoir at Shustoke, the banks of which would be raised so as to contain an additional 100 million gallons. The main objection to this plan is that it would exhaust the sources of supply throughout the Midland district; and in the meantime other cities would probably have appropriated the more distant sources now available. Ten or twelve years hence, the Birmingham Corporation would have to go before Parliament with a scheme for enlarging the supply, so as to be ready to put the works in operation at the end of the twenty years. But if the sources of an efficient supply were previously swallowed up by other communities, Birmingham would have to go a very long way for what it wanted, and would incur a proportionately greater expense. Even supposing the field remained open, there would most likely be the loss of all the money spent on the intermediate scheme; the works being rendered useless on the completion of the larger plan. Hence the conclusion arrived at is that the development of local resources will not prove an economical or a satisfactory way of dealing with the question; and the Elan and Claerwen scheme is preferred in "the best inte-"rests of Birmingham," unless, in the course of further investigation, some insuperable difficulty should arise.

It is important to observe the attitude of the Birmingham authorities with regard to the larger supply which they seek to obtain. They are afraid of being forestalled in respect to the Elan and Claerwen sources. As the herdmen of the patriarchs fought for their wells, so the local authorities of our own day are having a race for the watersheds. The fight takes place, not on the banks of the streams, but in the committee-rooms of Parliament. But if Birmingham is distressed, what is to be said as to London? One of our contemporaries remarks that so many basins are being secured by provincial cities and towns, that it will be difficult to find one remaining that will be adequate to the present and future requirements of the Metropolis. A kind of suggestion is made that there should be some central power by which the water supply of the kingdom might be regulated. Certainly we must suppose that England is able to yield a supply of water for all its inhabitants. But an unwise distribution may ultimately lead to embarrassment and expense, such as ought not to occur. Next session Birmingham may obtain parliamentary power to seize upon the watershed of Mid-Wales. A year later another appropriation may take place; and, on a review of the situation, it may be found that some of the localities have taken more than their share. The dilemma was very clearly apprehended by the Royal Commission on Water Supply which reported in 1869. One principle laid down in the report was that on the introduction of any provincial Water Bill into Parliament, attention should be drawn to the practicability of making the measure applicable to as extensive a district as possible, and not merely to the particular town. Mr. Mansergh, in his report to the Birmingham Corporation, anticipates that they will be required by Parliament to furnish a supply to towns adjacent to the line of the aqueduct. This condition he considers fair, and by no means onerous. Of course, London would have to recognize a similar obligation. But, in discussing this matter, consideration should be given to one passage in the report of the Royal Commission, where we read, in reference to Mr. Bateman's plan for furnishing a supply to London from North Wales: "Grave doubts may be "entertained whether it is desirable that the Metropolis "should be dependent on one source of supply so far "removed, and which might be liable to accidental "interruption."

The danger which would beset the Metropolis in the event of the water supply being solely drawn along a single line of communication from a remote spot, establishes the prudence of retaining the present supply, whatever else may follow. A supplemental source from a distance may some day be desirable, though we are not sure that any such necessity is near at hand. London, like Birmingham, may be capable of getting a sufficient supply from local sources for several years to come, and by skilful operations this period may be considerably extended. When the time comes for going to a distance, it will probably be seen that to sacrifice existing sources would be exceedingly unwise and perilous. The second string to the bow (if indeed it would not be something more) would be valuable for imperial and strategical reasons; and surely a wholesome supply of water, sufficient for the maximum requirements of at least six millions of people, is not a resource to be hastily abandoned—neither will it be, despite all the wild talk we hear.

The Royal Institution Lectures for the next three months have recently been announced. Among other engagements for the Friday evenings, it has been arranged that on June 12 Professor Harold B. Dixon, M.A., F.R.S., will treat of "The Rate of Explosion in Gases."

Another Crystal Palace Electric Light Exhibition.—The Directors of the Crystal Palace Company have decided to organize another Electric Light Exhibition, to be opened in the autumn of the present year. An effort is to be made to render this second exhibition as effective and popular as that of 1881-82, which was generally acknowledged to have been the most complete that had up to that time been held.

Death of Mr. Edwin G. Fox.—It is with much regret that we have to record the death on Monday of last week of Mr. Edwin G. Fox, at his residence Heatham House, Twickenham. The deceased gentleman was in his 71st year; and the cause of death was inflammation of the lungs. Mr. Fox had been a member of the Board of the Grand Junction Water Company since 1882. He was elected a Director in that year on the death of Sir Charles Derimus Crosley; and four years later he was appointed Chairman on the retirement of Mr. W. F. Higgins. In that capacity, his long professional experience of real property, and association with other Water Companies, were very valuable; and his services were highly appreciated by his colleagues, among whom was Lord Knutsford, the Colonial Secretary to the present Government. The Woking Water and Gas Company also had the advantage of his assistance in directing their affairs. Mr. Fox was the founder of the well-known firm of Edwin Fox and Bousfield. In 1870, his firm took up the question of dealing in New River shares, which were not at all understood in the market. They were freehold shares, and so not bought by property buyers; and yet being real estate, they were not bought by share buyers. In the year mentioned, the first auction of these shares was held by the firm; and from that time to the present, they have been recognized as the market for them. In 1888, they sold nearly a million of the stock; and in the following year they offered the first whole share that had ever been brought into the open market—realizing (as reported in the JOURNAL at the time) the enormous price of £122,800. On June 19, 1879, the firm placed on the market, under the auction clauses of the Company's Act, £100,000 of the stock of The Gaslight and Coke Company. They have also sold by auction nearly a quarter of a million of capital for the Grand Junction Water Company; and from time to time stock and shares in other gas and water companies have been disposed of by them. Mr. Fox retired from the senior partnership of the firm in 1885, and had been out of business some years before his death.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 650.)

THE re-opening of the Stock Exchange last Tuesday was not attended by circumstances conducive to an advance in values; and as the week progressed, the unfavourable influences were only augmented. Business was thus decidedly dull; and all the chief markets were depressed. The Bulgarian incident was the first to upset matters; the danger of a spark which might kindle that veritable powder-magazine, the Eastern Question, being notorious. Then came the rupture between Italy and the United States—a foolish affair; but acts of folly are often dangerous. To crown all, the death of the chief of the new Baring house just when Argentine affairs seem to be growing a little darker, put a finishing stroke to the depression of the week. Amid so much gloom, it is cheering to direct attention to the Gas Market, which has been bright and active, and has increased in strength. The Metropolitan Companies as a group have uniformly improved. Gaslight "A" was moderately dealt in at steady prices, coming out 1 better on the week. The debenture, preferred, and limited issues have been quite active, and very firm; but the 10 per cents alone moved up in quotation. All three issues of the South Metropolitan Company have advanced; but the only one to show any activity was "B." Rather more business than the average of late was done in Commercials; and the old and the debenture stocks have advanced. The Company had an agreeable meeting on Friday, when the raising of further capital was authorized. In bringing the matter before the proprietors, the Chairman made some sound observations upon the advisability, in the interests of the undertaking, of exercising great discretion in the issue of capital, the premium value of which is put into the pockets of the proprietors, and not into the business. It is evident that, although the privilege of receiving an allotment of new stock at par enhances the value of the stock in respect of which the allotment is to be made, yet as soon as the allotment has been effected the value of the stock "*ex* new" is to a certain extent reduced by the increased capital charge on the undertaking. The Suburban and Provincial Companies have been quite inactive; but Brentford new and Brighton have improved their quotations. Of the Foreign division, the Continental group were in favour. Imperial Continental is 1½ better, touching 234. Continental Unions, too, are higher. Bahia exhibits the only example of a retrograde movement. Among the Water Companies, East London were favourably affected by their report and accounts, and the quotation recovered; but most of the other Companies were adversely affected.

The daily operations were: Gas was fairly active and very firm on Tuesday. South Metropolitan "A" rose 3; Commercial old, 2; and Brentford new, 2. But no business was marked in them. East London Water recovered 1½. On Wednesday, Gas was nearly as active, and quite as strong. South Metropolitan "B" improved 2; and Commercial debenture, 1. Thursday's business was much about the same. Advances made were 1 each in Gaslight "A," Imperial Continental, and South Metropolitan "B;" and 3 in ditto "C." Transactions on Friday were fully up to the mark; and prices continued to rise freely. South Metropolitan "B" advanced 2; Brighton, 1; and Continental Unions, ¼. Bahia fell 1. On Saturday, the general strength was well maintained; and Gaslight 10 per cents rose from 2 to 3 per cent. Water was very flat. West Middlesex declined 3; Kent, 2½; Grand Junction, 2; and Lambeth, 1.

ELECTRIC LIGHTING MEMORANDA.

The Cost of Domestic Lighting—German Electric Lighting Legislation—Another Ultra-Scientific French Muddle.

A BOOK upon the use of electric lighting in the home has been published by Mr. and Mrs. J. E. H. Gordon, which has attracted some notice in the newspapers. It appears to be something after the style of those handbooks of the "æsthetic" order that have been only too plentiful since fashionable ladies took to instructing the world on the subject of wall-papers, fire-places, &c. The substance of the best portion of the book has been previously published in the *Fortnightly Review*. Writers in a few country newspapers have been impressed with Mrs. Gordon's graceful periods; but the unsympathetic people who know enough about electricity and lighting to do technical book criticisms for the electrical press, do not seem to think much of it. The *Electrical Review* is particularly severe upon Mrs. Gordon's way of comparing the cost of gas and electric lighting. Speaking as to the cost of electric light in London, presumably as supplied by her husband's Company—the Metropolitan—Mrs. Gordon says "the cost per lamp per hour is about 20 per cent. more than gas; but, owing to the far greater facilities for switching off the electric light when it is not wanted, when gas would have to be left burning, the cost per lamp is with ordinary care practically less than gas." How absurd and misleading this statement really is, our electrical contemporary spares us the trouble of pointing out, by giving a few incontrovertible figures proving that while the two systems of lighting are actually in use (without reference to the facility of turning off in either case, which cannot take anything off the bill), electric lighting must be at least three times as dear as gas. The critic of the *Electrical Review*, moreover, goes on to give the cost of light for the past quarter in the case of a small London residence, burning gas in kitchens, hall, and offices, petroleum-lamps in the living-rooms, and candles in the bed-rooms. The total cost was £4 10s. 4d. for 85 days; representing, according to the electricians' way of reckoning, 12,270 hours for their standard 8-candle lamps. At the average cost of ½d. per hour per lamp, which would correspond with a charge of 8d. per unit, the cost of this amount of lighting by incandescent electric lamps would be £12 15s. for current alone. If the renewal of lamps is added, allowing a life of 800 hours, and no breakages, this charge will be increased by the expense of 15 lamps at 3s. 9d., or £2 16s. 3d., which brings up the cost to £15 11s. 3d. The hire of a meter is an extra of at least £1. So that, without allowing for accidents, the cost of lighting this small house for a winter quarter by electricity supplied from a central station, at the rate mentioned, would amount to £16 11s. 3d., as compared with £4 10s. 4d. for lighting by mixed old-fashioned systems. And these figures, be it remembered, are not primarily ours, but are supplied from an electrical source.

An Electric Lighting Bill is now before the German Parliament, and speculative electricians have an opportunity for seeing how electric lighting enterprise is proposed to be treated in Germany, as compared with the arrangements in operation in the United Kingdom. It is significant of the difference between the administrative systems of the two countries that the German Bill contemplates putting the business of electric lighting under police control. Not only public lighting installations, but private plants and electrical factories as well, are brought under the provisions of this measure. The procedure is, on the surface, direct, speedy, and simple. A month's notice of the projected undertaking must be given to the police, to the postal telegraph department, to the local authority, and also to everybody likely to be affected by the adventure, including all previously licensed rivals. If there is no opposition, the necessary sanction will be given, subject to any conditions which may be deemed desirable; or, in the event of a refusal, an appeal will lie to the Central Land Court. All this seems clear; but the fact that the whole affair, whatever its character, is to remain subject to police supervision, is not reassuring to those who have had any experience of what this means. The patience of the German people under bureaucratic tyranny is proverbial; and probably German promoters alone could contemplate with resignation a proposal to put the whole electrical industry of an empire under the heel of the policeman.

An example of the danger of being too scientific in fixing the bases of statutory charges has cropped up, according to the *Electrician*, in connection with a dispute that has arisen between the Municipal Council of Paris and the licensed electric lighting companies. The technical gentlemen employed by the Municipality a few years ago to settle the terms of their electric light concessions, concluded that the proper way to charge for current supplied was upon the basis of the amount of light produced. Consequently, an elaborate physico-mathematical financial investigation, of the kind so dear to the French scientific man, was instituted, out of which the Commission emerged at last with the estimate that the equivalent of the light of one Carcel lamp could be produced by means of the incandescent electric lamp at a cost of about 0·3d per hour. In order to be quite fair, however, the concessionary charge was fixed at about 50 per cent. more than this, or (say) 0·432d. per Carcel-hour, out of which the concessionaires were supposed to be able to spare a handsome toll to the insatiable Municipal Treasury. Some of our Northern and Midland local authorities are pretty keen in the matter of indirectly taxing patrons of their gas undertakings; but they are mere amateurs beside the Protectionist, Chauvinist Paris Municipality, who, having gone shares with the Gas Company in one of the most oppressive arrangements of gas administration ever known, are now as ready to plunder the electricians. It seems, however, that the latter have proved equal to the occasion by producing a special lamp with an efficiency, while it lasts, of 3 watts per candle, whereas the normal lamp takes 4 watts per candle. The result is that the companies have been able to force their charge up to about 14·4d. per unit, or, when supplying at a rental charge, to get paid for four lamps in place of three, for the same expense. And as the Municipality pay for new lamps, there is a nice little extra bill for these. Naturally, after a limited experience of the way matters are going, the Municipality have struck upon their own account; while we may presume that the public, whose interest they were supposed to look after, are beginning to regard the electric light concessions settled in the most approved *fin du siècle* manner, as rather worse, if anything, than the stupid gas concession made nearly forty years ago.

Mr. William Fox, who was for 25 years an assistant of the late Mr. J. F. Latrobe Bateman, has been appointed to advise the Gloucester Corporation as to the best means of increasing the supply of water to the Witcomb reservoirs, and as to the practicability of obtaining a permanent or temporary supply from the River Severn, or by pumping from the northern drift under the Oxlease.

STEPHENSON CLARKE.

We regret extremely to have to record the death of Mr. Stephenson Clarke, which took place at his residence, Croydon Lodge, North Park, Croydon, last Friday morning, in his 67th year. The deceased gentleman had been in failing health for some months (his malady being Bright's disease); and a few weeks before Christmas last he arranged to visit the South of France with the view of deriving benefit from the change. Unfortunately, the disease had developed to such an extent that the project had to be abandoned, and Mr. Clarke was compelled to take to his bed. For some weeks past his medical adviser (Dr. Philpot) had been in constant attendance; the assistance of an eminent specialist from London being frequently obtained in consultation. Unhappily, their efforts to save their patient were unavailing. Mr. Clarke was born at "The Rookery," Lower Tooting; and, having entered business as a coal merchant, founded the firm of Messrs. Stephenson Clarke and Co., one of the largest concerns of the kind in the country, and it might be added the largest in the world for the supply of coal for gas-making purposes. He was also identified with the gas industry in an administrative capacity; being a Director of The Gaslight and Coke Company and the Ottoman Gas Company, as well as having an interest in many other gas undertakings. He leaves a widow and a large family.

The following reference to the late Mr. Clarke, who occupied a prominent position in the district in which he had been so long identified, appeared in Saturday's *Croydon Advertiser*: "In all probability there was no other man in Croydon and the surrounding district whose charities were so extensive or whose purse was so constantly at the disposal of any and every good cause. From the time when he first came to reside in Croydon, now about twenty years since, Mr. Stephenson Clarke had been proverbial for his open-handed and entirely disinterested generosity to all worthy objects in connection with the borough of Croydon and the surrounding district; and for years past scarcely a single subscription list has been issued which has not been headed by his name. To ask of Mr. Stephenson Clarke was to receive, provided only that the object was a worthy one; and it cannot be said that his charities were anything but disinterested, for the deceased gentleman's personal connection with the town was so slight that every successive subscription meant something parted with with no possible hope of securing what is so often the mainspring of benevolence—an adequate *quid pro quo*. In a town of the size of Croydon, this means a good deal; but in addition to this, Mr. Stephenson Clarke, in the most unostentatious manner possible, was constantly engaged in the distribution of private benefactions, the vast extent of which was only known to himself. At Croydon Lodge—formerly the residence of Sir Charles Hood—Mr. Stephenson Clarke entertained with the greatest hospitality; and his loss will be felt almost as keenly in social circles as among those whom his beneficent charities so frequently aided. The news of his death will be received, by all to whom he was known, with feelings of the deepest regret, mingled with a tinge of relief at the thought that his painful sufferings are now at an end."

ROBERT KING.

It is with very great regret, which will be shared by many of our readers, that we have to announce the death on Good Friday of Mr. Robert King, the Engineer and Secretary of the Singapore Gas Company. Mr. King was born at Ayr in 1822; and in 1842, he came to London, and for four years was a student at the old Putney College for Engineers, of which Dean Cowie was the Principal. On leaving the college, he went into the office of the late Mr. Page, C.E.; and afterwards for a time was at the works of the Crystal Palace Gas Company. About this period the late Mr. H. Palfrey Stephenson, Mr. J. W. Gray, the Engineer of the Birmingham Corporation Water-Works, and Mr. King, with a few others, founded the present Society of Engineers; and we believe that of those who originated the Society, Mr. Gray is now the only survivor. The manner in which this Society has flourished is remarkable; and this has been mainly due to the great interest taken in it by those who were connected with it in those early days. The meetings were first of all held in a small room at the back of a tobacconist's shop in the Strand. The Society subsequently shifted to more superior quarters in King William Street, City; from thence the members went to Exeter Hall; and at the present time they assemble in the Westminster Town Hall. The Singapore Gas Company was formed by Mr. King in conjunction with Mr. H. P. Stephenson; and from its commencement to the day of his death, he had been the Engineer and Secretary—the success which has attended the undertaking being due in a great measure to the personal attention he had throughout devoted to it. Mr. King was one of the Auditors of the Bombay, Ceará, and Georgetown Gas Companies, and was also a shareholder in others, at the meetings of which in the City he was regularly present. Acute pneumonia was the cause of Mr. King's death, after only a few days' illness.

THE PROBLEM OF THE DIFFUSION OF LAMP-LIGHT.

Now that our very scientific friends the electricians are grappling with the practical development of lamps and the apparatus of public and private lighting in general, we must expect to see them turning over for their own purposes much of the same material that gas engineers threshed out, as they imagined, many years ago. It will be very interesting, and not a little instructive, to see what they make of such considerations as the influence of glass screens upon the transmission of light, the artistic treatment of lamps, and similar important problems, which gas engineers have had to solve as best they could for their own generation. We do not propose to discuss the latter topic at present, further than to point out how strikingly the manufacturers of a large class of electric light fittings have illustrated the common observation that when man wants a new appliance, or has to deal with a new material, he is prone to copy some previously existing appliance or material, as the case may be, instead of starting something quite novel. It is a complaint of the more fastidious order of electricians, who would like to have everything connected with their new lighting systems equally fresh, that too many "electroliers" are obvious "gaseliers, with a difference"—the difference mainly consisting in the fact of the end of the branch or arm that carries the light being turned down instead of up, and terminating in an incandescent lamp-bulb instead of in a gas-burner and globe. The reproach reminds us of the similar accusation which was long ago levelled at the manufacturers of gas-pendants, &c.—that they could not get away from the patterns appropriate for oil and candle fittings. It is the same manifestation of the limitation, conservatism, poverty of invention, or whatever we may prefer to call it, of mankind which can be seen in the imitation by the old architects, who first began to build in stone, of the wooden structures of their fathers. Still, the electricians have not so much reason to complain of their artistic hardware as people of taste had against the ironmongers who made flat gas-flames surmount glass imitations of wax candles. Nobody has ever put an incandescent electric lamp into an old-fashioned half-ground gas-globe, with gallery and all complete.

The question that seems to interest electric lighting engineers at present, as a matter of practical illumination, is the well-worn one of the obstructive effect of glass screens of different descriptions, which many gas engineers have investigated before them—notably that reliable experimentalist, the late Mr. F. W. Hartley. The subject is not without its special difficulties for electricians; the principal one being their standing bugbear of expense. The electric arc ought to be a cheap light, having regard to theoretical considerations. But practically it is very dear; and this is largely due to the fact that the light is useless for ordinary purposes unless it is modified by heavy opal glass globes. The same difficulty occurs with incandescent lamps for interior lighting. Indeed, the trouble is more serious with these, inasmuch as they cost so much more than arc lights to begin with. General Webber, at Chelsea, enthusiastically advocates 8-candle lamps, which after a few weeks' service most likely drop to about 6-candle power, for common use. Although he is probably sincere in his professed belief that lamps of this power are brilliant enough when there is nothing brighter in a room to make them look dingy by comparison, yet shopkeepers and others will not accept them as equivalent in lighting effect to good gas-burners. But the electrician is met with the difficulty that an incandescent lamp of any but the smallest size dazzles the eye that looks at it, and is, after all, not more ornamental, with its "glorified hair-pin," than an old-fashioned naked gas, oil, or candle flame. When even candles are screened with a view to saving the eye from glare, and also to give a pretty effect, it is absurd to expose a gleaming filament to view without anything to soften its trying brilliancy. Yet it cuts an electrician to the heart to screen his incandescent lamps, which cost so much that they can hardly be made to go down by any amount of rhapsodizing about their advantages on the score of healthfulness, cleanliness, coolness, &c. He knows that if these lamps are to be screened, either by means of ground or opal glass, or fabric, two or three will be needed to do the work of one naked lamp; and who will stand this?

It is sorrowfully conceded, however, that the frosted bulb is called for, and must be supplied. But what about the terrible loss of light in this case? Well, there are some electricians who may be depended upon to rise to any emergency, like Tommy Atkins, and defend positions which to everybody else would appear untenable. Professor Forbes is such a man. Upon one occasion he said that in his opinion a number of posts, with gracefully drooping overhead wires connecting them, were decidedly ornamental accessories to the arc lighting of parks, open spaces, &c. Nobody agreed with him; and it made no difference to the progress of the movement for requiring electric lighting wires to be put underground. But the declaration was at least of notable intrepidity. Now he comes forward and says that ground glass practically does not obstruct light. He describes ground glass as consisting essentially of "a mass of prisms and reflecting surfaces;" and he suggests that as the glass itself is really clear, the lamplight must get

through it after all, though it may suffer somewhat from internal reflection. It must be admitted that this is a very plausible way of putting the matter; but did the learned Professor never have occasion to remove the ground glass shade from gas-flame or oil-lamp in order to get a better light?

The photometer tells us that ground-glass globes obstruct from 18 to 20 per cent. of the light of an ordinary gas-burner (Hartley); but the electricians seem inclined to contest this statement, and to ask where the light goes to, if it does not escape through the glass after all? It is clear that the inside surface of a lamp-globe must reflect a portion of it back upon the flame or light-source; also that some is absorbed by the glass itself, which is not perfectly transparent, and a third portion is reflected inwards by the second surface. The first two portions of the total loss are unaffected by grinding or depolishing the second surface. When this is done, however, the amount of internal reflection must be considerably increased. The *Electrician* remarks upon this subject that the increased loss by internal reflection from a ground-glass surface of a lamp-globe may be accounted for by the increase of the angles of incidence, and thinks that probably only one-half of the light passes directly through, losing nothing by the refraction, but that the other half is tossed backwards and forwards by internal reflections, so that not much more than half of it really goes through at all.

Different valuations of the amount of obstruction of light by ground-glass globes and screens have been published; some making it as high as 40 per cent., and others as low as 15 per cent. It should be remembered, however, that the general name of "ground glass" covers a multitude of different varieties of the article. Either very fine or very coarse ground surfaces make the glass approximate to the clear article in respect of light-transmission; and, besides, the transparency of the glass itself may vary. Also, Mr. Hartley found that both the intensity of the light-source and its distance from the ground glass affected the amount of absorption by the latter. It is probably safe to take the obstruction of light from a common gas or incandescent electric lamp by ground-glass globes, in the dusty condition which would obtain in ordinary circumstances, as amounting to at least 25 per cent. This is a serious consideration for electricians, who can by no means afford to have the cost of lighting a room by their incandescent lamps increased by one-fourth, merely because the exposed-filament lamps are condemned as "bad for the eyes," which is undoubtedly true. Consequently, they attempt to overcome the difficulty by using cut or faceted glass—not for the lamp-globes, which would not stand such treatment, even if it did not add greatly to their cost, but hung round them as a sort of jacket. A firm of electrical fittings manufacturers have recently brought out an arrangement of this kind which they call a "bead ray-diffuser," which is simply a rather open network of crystal faceted drops fastened to a metal ring clip, by which the little bag is fitted round the neck of an incandescent lamp. The makers pretend that this fitting absorbs no light at all; but they might as well have claimed that it increased the light, as the "water lantern" people did for their modification of the well-known engraver's lamp. It is more to the purpose to say that the fitting is pretty, and suitable enough for some lamps, especially when a sufficient number of lamps are used in a large room, so that the inevitable spotty shadows which they must make would escape notice.

At first sight it may appear strange to speak of the shadows thrown by sparkling cut glass interposed in the path of rays of light; but a little reflection will show why this must be so. A cut-glass drop spun rapidly in front of a light in order to neutralize the planes and prisms of its surfaces will absorb about as much of the light as ground glass. As used, however, and perfectly quiescent, the effect of the plane and prismatical portions is not only to give the light-source itself a jewel-like appearance; but also to throw regular shadows (say) on the ceiling of the apartment, from the less brilliant portions of the glassy envelope. One cannot have a lamp sparkle in one place without looking gloomy by comparison in others. Indeed, it is the difference of brilliancy of adjacent portions that gives the sensation of sparkling. Hence, while a sparkling light, or a number of them, may, under some conditions, be pretty to look at, it by no means follows that the same description of lights will be good to see by.

The whole question of the absorption of light by imperfectly transparent media is indeed of great interest; and a young engineer, whether trained in gas or electrical work, who can say off-hand what happens to prevent clear or ground glass from transmitting all the light from one surface which it receives on the other, must have progressed pretty far in the study of the laws of light. The question is so intimately connected with the practical considerations of interior and open-air lighting and illumination, moreover, that it must of necessity be studied by all who seek to acquire mastery of this difficult branch of *technique*. Why it is necessary to use translucent screens for lights, what is their office, how they perform it, and which is preferable for a particular application—these are all devolopments of the general problem of artificial lighting which is now being attacked from a fresh standpoint; and, as we stated at the commencement of this article, it will be interesting and most instructive to see what the order of new students make of it.

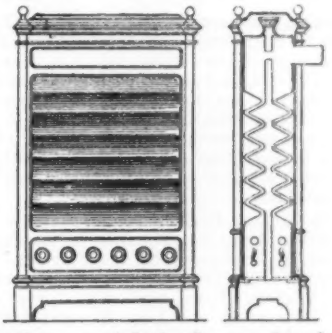
NOTES.

The Recent Frost.

Particulars of the great frost of 1890-91, as it affected gas and water pipes and works fittings, are needed to complete the record of this exceptional season. According to a paper upon the frost contributed by Mr. C. Harding to the Royal Meteorological Society, the period of frosty weather lasted from Nov. 25 to Jan. 22; and over nearly the whole of the South-east of England, the mean temperature for the 59 days was more than 2° Fahr. below the freezing point, while at seaside stations on the south-eastern coast line the mean temperature was only 2° higher. In the Southern Midlands and parts of the South of England the mean temperature for the 59 days was more than 10° below the average; but in the North of England the deficiency did not amount to 5°, and in the extreme North of Scotland it was less than 1°. In many places in the South and South-west of England, as well as in parts of Scotland and Ireland, the greatest cold throughout the whole period occurred at the end of November. In many places in England, the frost was continuous for 25 days. Ice in the Regent's Park, London, attained the extreme thickness of 9 inches. The frost did not penetrate the ground to a depth of 2 feet in any part of England; but in many places, especially in the South and East, the ground was frozen for several days at the depth of 12 inches, and at 6 inches deep it was frozen for upwards of a month. In the neighbourhood of London the cold was more prolonged than in any previous frost during the past 100 years. Gas and water pipes at a depth of 2 feet below the surface are therefore practically free from risk of freezing in England. In the United States, there are many districts where the ground is known to freeze to twice this depth—advancing downward at the rate of about 0·2 foot per day in ordinary soils.

A German Gas-Heating Stove.

The accompanying illustration represents with a completeness that does not call for much verbal description, a pattern of gas-heating stove which has been found very successful in the laboratories, offices, &c., of the Badische Anilin und Soda Fabrik at Ludwigshafen-on-Rhine. The Company have private gas-works; and long since attempted to warm their shops by means of gas-heating stoves purchased for the purpose, or made up on the spot in the ordinary patterns. The result was not satisfactory, however, until the Company's engineers took the matter in hand, and produced the arrangement shown, which



is nothing more than a neat device for warming air while at the same time obtaining some radiant effect, by burning gas at the bottom of corrugated sheet metal conduits. A trough is provided for supplying humidity to the warm air; and as the gas-flames do not touch anything, there can be little or no offensive odour from the stove. A flue-pipe is provided, however, for discharging the products of combustion. The air circulation may either be confined to the apartment in which the stove stands, or a fresh supply can be brought from without. The duty obtained from stoves of this design is claimed to be good. The manufacture of the stoves for the general market is now undertaken by Herr C. Ficus, Engineer, of Darmstadt. They are, of course, made in different sizes.

The Quality of Paint Oils.

An article upon paint oils in the *Chemical Trade Journal* contains some information interesting to engineers and others who use paint more for the protection of corrodible materials of construction than for decoration. Linseed oil is the most important medium for carrying preservative paints, because it dries better than any other oil, and is the cheapest of its class. The property of drying, which gives linseed oil its peculiar value, is due to the presence of linolein, a compound of glycerine with linoleic acid. The real nature of the drying of oil is not fully understood; but oxygen is absorbed in rather large proportion—from 150 to 180 times the volume of the oil. Raw linseed oil has had very little done to it. Its specific gravity ranges from 0·932 to 0·937; Baltic oil being the heaviest as a general rule. Also, the heavier the oil is the better. Linseed oil is too cheap to be adulterated by any other oils except mineral and rosin oils. These can be detected by the flash point, which will range from 380° to 400° Fahr., while linseed oil flashes at about 500° Fahr. The addition of mineral oils lowers the specific gravity, while

rosin oil raises it. Both additions are bad. Boiled oil should be pure linseed oil that has been heated for some hours to a temperature of 500°, which increases its specific gravity to about 0·947 and darkens its colour. Boiled oil is much adulterated and imitated, there being on the market at present several so-called "patent boiled oils." These necessarily vary in composition; but generally they are mixtures of genuine boiled oil, rosin, rosin oil, turpentine, heavy petroleum spirit, and linseed oil. None are equal to the genuine article—they have not the same drying powers; and those which contain rosin oil have the most undesirable property of becoming sticky a few weeks after they are used, although at first appearing to dry well enough. The average proportions for mixing with paint are, one pint of turps to a gallon of oil; and the oil is a mixture of three parts of raw to one of boiled oil. This will vary for different pigments, white lead for instance taking more turps than lamp black. Rosin oil seems to be the worst adulterant. It may be distinguished by its great weight, the possession of a bloom or fluorescence, by its odour when heated, by its taste, which is peculiar (sharp, burning), and by being unacted upon by caustic soda.

A High-Speed Gas-Engine.

If the search for a practicable hot-cylinder gas-engine has not been dropped for the present, it is apparently checked; and the efforts of inventors are directed to other ways of increasing the efficiency of gas in motor engines. Speed is a consideration in this connection, especially having regard to the economy of space which a high-speed engine presents in comparison to a low-speed motor. Among new gas-engines, attention is being directed to the Daimler type, which is designed for speeds greatly in excess of the usual rates for gas-engines. The Daimler gas-engine has a peculiar appearance, as there are two somewhat long cylinders fixed vertically, but converging at the lower ends, where they are bolted upon a circular cast-iron case which contains the crank. All the moving parts are therefore enclosed while the engine is running. It works at from 500 to 600 revolutions per minute; and is very compact—an engine of 2-horse power standing only 3 ft. 2 in. high, and weighing 300 lbs. The Daimler engine from its fast running is claimed to be specially suitable for driving dynamos for electric lighting. At present 4-horse power is the largest size to which these machines have been made for regular use, although a 10-horse power engine is spoken of as having been tried with petroleum vapour for road-car locomotion.

The Forthcoming Congress of Hygiene.—The Council of the Society of Arts, acting under the provisions of the Benjamin Shaw Trust, have offered two gold medals, or two prizes of £20 each, to the Executive Committee of the Congress of Hygiene and Demography for any inventions or discoveries of date subsequent to 1885, exhibited at or submitted to the congress, and coming within the terms of the Trust. Under the conditions laid down by the donor, these prizes are to be offered for new methods of obviating or diminishing risks incidental to industrial occupations.

Miss Kelman's Cookery Lectures at the Glasgow Exhibition.—Miss Kelman closed her course of cookery lectures at the Glasgow East-end Industrial Exhibition on the 27th ult. Her original engagement with Mr. Darwin (with whose gas-stoves the demonstrations were performed) was to lecture for one week only; but so much interest in the lessons was manifested by the visitors to the exhibition, that she was induced to prolong her stay for another fortnight. The lectures were listened to by large numbers of persons; and at their close Miss Kelman was presented by the Treasurer of the exhibition (Mr. A. A. Downie) with a beautiful gold watch and wristlet, subscribed for by the ladies who had attended her classes.

The Notification of the Metropolitan Gas Referees for the "summer" six months of the present year has just been issued. There are but few alterations in it to call for mention. Another (the fifteenth) testing-place for The Gaslight and Coke Company's gas is specified—at 66, George Street, Hampstead Road. No alterations are made in the two stations where the Commercial Company's gas is tested; nor in the six for the South Metropolitan Company's gas. In their directions as to the times and mode of testing for illuminating power, it was formerly stated: "The testings for illuminating power shall be three in number daily; but if one of these testings assigns to the gas an illuminating power differing by more than 1½ candles from the illuminating power assigned to the gas by another testing, or if the average of three testings of illuminating power fall below the prescribed illuminating power, a fourth testing shall be made." It is now specified generally that, "if the average of three testings of illuminating power falls below the prescribed illuminating power, a fourth testing shall be made." It is also provided that "no gas shall pass through the meter attached to the photometer except that which is consumed by the standard burner in testing, or during the intervals between the testings made on any day." The time during which the candles are to be alight before beginning each test is extended from ten to fifteen minutes. The usual lower summer maximum amount of sulphur compounds other than sulphuretted hydrogen—17 grains, instead of the winter 20 grains—is the only other change of note.

COMMUNICATED ARTICLE.

SEPARATELY MEASURING GAS FOR COOKING AND LIGHTING PURPOSES THROUGH ONE METER AND SERVICE.

By E. U. G. Ernst, Engineer and Manager of the Aarhus (Denmark) Gas-Works.

It is a gratifying fact that gas finds more and more favour with the public as a substitute for fuel, on account of its excellent qualities, cleanliness, accommodation, and economy; and as this is a matter of great importance for gas-works, I think every conscientious gas manager ought to study how to promote its use, so that it may become a necessity in every household. Making a reduction in the price will always be the most practical means of attaining this end. When, therefore, two years ago, the question of employing gas for cooking purposes was having considerable attention in our town, we resolved to try to increase consumption in this manner.

In order to ascertain to what extent gas was used for culinary purposes, an enumeration was undertaken, which showed that there were 400 families who burnt gas for both lighting and cooking. A reduction in the price of gas consumed for cooking would require these 400 families to have two meters, and their services taken down and altered, and in many cases new services laid into the houses, so as to avoid the so-called "bi-meters," which give rise to complaint from the public, and cause a great deal of trouble in making out accounts. These arrangements would involve cost and dissatisfaction, both to the consumers and the suppliers of gas. It occurred to me that there was a way of avoiding these inconveniences; and I eventually succeeded in finding out a method by which the consumers could keep their services unaltered, and still derive benefit from the reduction in price, without incurring expense for new meters.

My plan is founded on the following facts experienced in every-day working: (1) That the consumption of gas for lighting purposes in the month of June may be regarded as almost *nil;* and (2) that the consumption of gas for cooking is, on an average, almost the same all the year round. We may therefore assume that a customer's gas consumption in June is equal to his monthly demand for gas for culinary purposes, and that consequently (1) his yearly consumption of cooking gas is equal to twelve times his consumption in June, and (2) his consumption of lighting gas equal to the consumption beyond that.

The following table, in which I have taken the consumption over a year, shows the plan more clearly:—

	Quantity of Gas Consumed. Cubic Feet.	At the Cooking Price. Cubic Feet.	At the Lighting Price. Cubic Feet.
June, 1890	1,000	1,000	—
July ,,	1,100	1,000	100
Aug. ,,	1,300	1,000	300
Sept. ,,	1,500	1,000	500
Oct. ,,	1,800	1,000	800
Nov. ,,	2,300	1,000	1,300
Dec. ,,	3,000	1,000	2,000
Jan., 1891	2,800	1,000	1,800
Feb. ,,	2,200	1,000	1,200
March ,,	1,700	1,000	700
April ,,	1,400	1,000	400
May ,,	1,200	1,000	200
Total	21,300	12,000	9,300

The consumer will consequently have to pay for his total gas consumption in the following proportions: 12,000 cubic feet at the price of cooking gas, and 9300 cubic feet at the price of lighting gas. It is evident, however, that a consumer might endeavour to take advantage by burning a great deal of gas in June, as he would then get part of his winter consumption of lighting gas at the price of cooking gas. This may easily be prevented by making the following stipulation: "If the consumption in June exceeds that of May or July in the same year to the extent of 25 per cent. or upwards, the normal monthly consumption of cooking gas is to be reckoned as equal to the smallest consumption in these months." It would also be advisable to make it a condition, as against consumers whose consumption of lighting gas in June amounts to a considerable part of the total quantity burnt in this month, that the gas company are to be entitled in such cases to have separate meters fixed for registering the supply of cooking gas.

After full discussion in the Town Council, the system I have described was adopted in Aarhus as from June 1, 1889; and since that time it has answered perfectly all the expectations entertained in regard to it. First of all it has the advantage of saving the gas undertaking the expense of purchasing and maintaining a great many meters; and, secondly, the consumers are spared the cost of altering their services, while they still profit by the reduction in the price of cooking gas. As to the calculation of the amounts of the accounts, which it was apprehended would present some difficulties, I am pleased to state that nothing of the kind has occurred, and not the slightest inconvenience has been caused.

It would give me great pleasure to see this method introduced in other countries; and to this end I shall be willing to answer any letter on the subject, or to give any further explanations that may be required by my highly-esteemed colleagues in England or elsewhere.

TECHNICAL RECORD.

THE DESTRUCTION OF A GASHOLDER AT CONSTANTINOPLE.

In the JOURNAL for Feb. 3 last (p. 206), we gave an account of a catastrophe which occurred at the works of the Yedi Kouli Gas Company, at Constantinople, on the morning of the 24th of January, whereby three lives were sacrificed, and the buildings and gasholder destroyed, by a terrible storm of wind and rain which visited the city and its vicinity. The disaster, especially as regards its effect on the gasholder, was dealt with by Herr Julius Ginzel, one of the Engineers at the Vienna station of the Imperial Continental Gas Association, in a communication to the *Gastechniker* of the 1st ult.; the following being a translation of his remarks:—

In the last number of the *Gastechniker*, it was stated that the results of an investigation should be awaited before dealing with the subject of the destruction of the gasholder at Constantinople. I am afraid it will be long, very long, before anything appears in public about it. The Company suffering from the disaster, and their Engineers, have other matters to care for than investigations, as they have to provide for the lighting; and I do not know if the Government authorities feel competent to inquire into the cause of destruction. The question would, I think, be readily settled if the firm who built the destroyed holder could be known, and if that firm would publish the drawings for examination. If all journals devoted to gas interests would endeavour to be active in this direction, probably something could be ascertained before any results were arrived at from investigations on the spot.

The destruction of the holder is especially remarkable, for the storm causing the dreadful accident was not one of the most violent. We, in Vienna, have had far more terrific storms to endure. I am indebted to the Observatoire Impérial Météorologique de Constantinople for the communication that the velocity of the storm on the 24th of January, 1891, at four o'clock a.m., was 24 to 25 metres per second; at five o'clock (the time of the disaster) there were gusts of wind, the velocities of which varied from 27 to 29 metres; and from this time onwards, the storm was diminishing.

Taking the maximum of velocity as 29 metres, and assuming that the gales met the total surface of the holder, and that the wind pressure is to be calculated on the formula $P = 0{\cdot}132\ v^2$, the maximum pressure on a plane vertical to the direction of the wind is 111 kilogrammes per square metre. The pressure on the cylindrical form of the holder is estimated, according to the "Engineer's Pocket Book" (Hütte), with 0·57 P; according to other authors, with 0·66 P; and according to my studies on this subject in the *Gastechniker* and *Civiltechniker*, with 0·79 P. This pressure is therefore 63, 73, or 87 kilogrammes per square metre of the projection of the cylinder. It must be conceded that these figures are far below those fixed for wind pressure by the Austrian Government in statical calculations; but they agree nearly with the figures given in his "Guide-Framing" by Mr. F. S. Cripps, who takes 78 kilos. per square metre (16 lbs. per square foot). A calculation of the holder with any of the above-mentioned pressures should show in every part of the construction a factor of safety of 4 or 5. At Constantinople, the factor of safety was less than 1; there was no elasticity; and the fracture occurred.

It is to be remembered, too, that the fracture did not take place when the greatest possible forces were in action; for the holder was only about two-thirds full at the time. The wind pressure was then only two-thirds of the maximum pressure; and the moment of the forces was $\frac{8}{9}$ *less than the maximum moment*. This shows how extraordinarily small must have been the resistance of the construction; or, probably, that the calculation was false, or the workmanship very bad, or there were other causes for the destruction. The tank of the holder was made of steel—it may be, steel of lower strength than usual. The foundation of the holder may have been badly built; and there were strains in the sheeting of the tank, which, added to the strains from the wind pressure, effected the fracture.

SOUTH-WEST OF ENGLAND DISTRICT ASSOCIATION OF GAS MANAGERS.

The "Official Report" of the Twenty-Seventh Half-Yearly Meeting.

(*Concluded from p.* 598.)

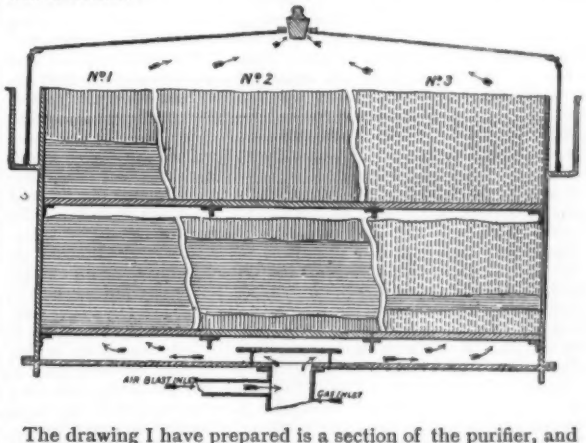
The second paper read was by Mr. F. G. DEXTER, of Winchester, entitled—

SOME EXPERIMENTS ON THE REVIVIFICATION OF OXIDE OF IRON IN CLOSED BOXES.

Some time ago the idea occurred to me to try to reduce, or obviate entirely, the cost of emptying and refilling purifiers. The opinions expressed in existing accounts of attempts to revivify *in situ*, by the admixture of air with the crude gas, being somewhat divided as to whether any reduction in the illuminating power of the gas does or does not result from this practice, I wished to try revivification on boxes "standing off" as foul, and therefore altogether out of contact with passing gas—a process which, if successful, would effect great economy, avoid a standing nuisance, and meet the scruples of those who, though acknowledging the desirability of reform in this department, objected to effect it at the risk of lowering the illuminating power of the gas.

In commencing the experiments, I had the fixed idea that we dealt with a solid body capable of undergoing particular changes by the application of coal gas under certain physical conditions of rate of flow and pressure, and that this material, when fouled, could be made to undergo the reverse changes by the application of another gas, oxygen; and therefore, if this second gas were applied to the spent material under similar conditions inside the box, then the reverse action—revivification—should be effected without difficulty. I had constructed a small test-box, made to scale of one of the purifiers on the works. The inlet in the centre of the bottom was connected direct to the inlet-main of the purifiers, and also by a branch service, controlled with taps, to a small holder containing air. On the top of the box, in place of the usual vent-plug, a leak-detector was fixed; and in one corner a pressure-gauge. First filling the box with fouled oxide taken from a purifier just shut off, I carefully passed the air through until it appeared revivified, and then shut it off entirely, to wait until the same oxide, taken from the works purifier, had been renewed in the ordinary way, and put back. The foul gas was then sent into this box, and at the same time a small quantity, in proportion to the hourly make and the size of the test-box, was turned through that. By this arrangement I had two purifiers, each purifying coal gas of the same consistency in proportion to their respective capacities, and both filled with the same oxide, but with the difference that while the oxide in the works purifier had been revivified as usual, that in the test-box had been revivified by a current of air passed through it. It will be understood that the registration was obtained by the station meter on the one hand and the leak indicator on the other. The gas was carefully tested every hour.

The result of this experiment was that the works purifier ran 14 days without showing any trace of sulphuretted hydrogen, while the test-box lasted three days longer. When fouled, I revivified the test-box by the air-holder as before, and then again worked the foul gas through; repeating this alternately with perfect success so often that it seemed waste of time to further prolong the experimental trial with the test-box. Accordingly, to the inlet-main of the works purifier I attached a 2-inch air-pipe, which was carried through to the engine-house, and attached there to a small pressure-blower, the pulley of which was driven direct by a belt from the fly-wheel of the exhauster engine. My intention was to reproduce the exact conditions of the test-box on a larger scale, when it seemed to me that success was certain to follow.



The drawing I have prepared is a section of the purifier, and represents in transition the conditions of three distinct series of trials. Section No. 1 shows the first attempt. In this case I had a free current of air passing up through the box, and escaping by the top centre plug, as shown. The pressure in the box was 3-10ths of an inch; and it took three days to revivify 8 inches of the top layer of material [shown by the vertical shading in the section]. Then with a sharp line of demarcation, the foul oxide [shown by the horizontal shading] commenced, to all appearance as bad as if no air had ever passed. Complete revivification was effected in about eight days. This result clearly proved that the conditions of revivification differed from those of the test-box, and the difference was this: During the test-box trials, the air was filtered through at slow velocity and under the same pressure as obtained in the box during the passage of the coal gas; but in the trial of the works purifier, above alluded to, a large volume of air passed while the pressure was only 3-10ths of an inch. To obtain the increased pressure required, I introduced counter-shafting between the exhauster engine and blower; and after fouling the box again, the air was turned on at a pressure of 7-10ths of an inch, and the flow diminished by the plug at the top being set partially open with small wedges. The greatly improved result of this change is indicated by section No. 2; the air having penetrated in the same space of time right through the top layer, and a small portion of the second. In

addition to this, revivification had set in to some extent at the bottom. Complete renewal was effected in five days.

After several other trials to settle satisfactorily in my mind some points that occurred to me as worthy of closer investigation, I began the next and last series of trials, shown by section No. 3. Into the same box, fouled as before, the air-blast was turned at a pressure of 1½ to 2 inches, and with the flow still further reduced. In two days the box was revivified through the top layer [see dotted lines], and very nearly through the second; the narrow streak of 3 inches that remained being disposed of well within the third day. In this case also revivification had set in to a slight extent from the bottom upwards, independently of the principal action downwards. I did not experience any difficulty in repeating these results on the same box several times over; but as they pointed all through the experiments to the necessity of reproducing, as nearly as possible, the same conditions in the box during revivification as obtained during the fouling of the oxide by the coal gas—that is to say, a slow movement of air, producing lengthened contact with the oxide, at some degree of pressure—I greatly desired to work up in one, or at the utmost two more stages, to the final conditions of air current and pressure used in the preliminary test-box experiments, when to revivify a box completely should take some 24 to 30 hours only, and thus reduce the process to limits thoroughly practicable and convenient.

Unfortunately, having but the smallest size pressure-blower fixed for these trials, I found that its capacity had already been reached, and the maximum pressure wanted—6 inches—could not be obtained without so far reducing the current as to impair the results. Being at this time about to remove to take my present appointment, I had no means of getting a larger pressure-blower fixed to bring the trials to a final issue, but only to establish the fact that any reduction, either in the pressure or quantity of air used during the trial represented by section No. 3, led to a prolongation of the time required for revivification.

In case it may not be very clear to some why importance is attached to the question of pressure when we are considering purely chemical reactions, I would explain that it is simply to the physical, and not the chemical aspect that it has reference. For instance, comparing sections Nos. 1 and 3, there was no appreciable difference in the efficiency of the revivified oxide—the chemical part of the work being equally well done; but compared on the time basis, No. 3 section is an advance of about 400 per cent. on the results of No. 1 section. The condition of pressure simply enables the air to penetrate the pores of the oxide in sufficient quantity within a practicable space of time.

Circumstances preventing my following up the results just now, I have determined to place them before you as they stand, in the hope that they may interest, or still better incite some to take up the thread, and bring the work to a satisfactory conclusion. Many of the features of these experiments appearing strange to me, I read up as much information as I could find relative to the behaviour of oxide as used for purification; and in doing so I discovered that, some time previously, attempts to revivify oxide upon somewhat similar lines had been made, and had proved quite successful up to the third or fourth renewal, when the back pressure brought about by the caking of the oxide became prohibitive. It appears, however, that the air-blast was obtained by means of a steam-jet injector. This fact—the presence of the steam—is, to my mind, largely responsible for the back pressure recorded; as the soddening effect it has on the oxide has doubtless been noticed by those who have had occasion at any time to steam the plant anywhere near the inlet to the purifiers. Of course, the oxide does harden to some extent, as in every other process of revivification *in situ;* but mere back pressure, within reasonable limits, in the boxes or anywhere else, is nothing to be afraid of, so long as it is kept off the retorts. It is, after all, a question of degree; the working pressure during the summer in certain works being a great deal heavier than at others under maximum strain in winter. I am quite sure also, from the results obtained during the experiments, that the oxide in use in different works might be readily treated with some opening material, to counteract any excessive caking tendency.

With regard to the possible objection entertained by some, that great risk is run of the box overheating and firing, I would say that it is a point which need not be feared in the slightest degree with ordinary care. The heating being due to the chemical reaction of the sulphide of iron and oxygen of the air supply, the temperature reached in the box depends entirely upon the quantities of these substances brought into contact within a given time; and it is a simple matter to keep the air supply checked within the necessary limits until the more violent action is over. In practice, I found that the box reached within the first two hours the maximum temperature which appeared to be safe, and that after this it rapidly cooled; so that in about 2½ hours from the start, no further attention was necessary—the air-blast being turned on fully and left to do its work.

The action which has puzzled me most is the behaviour of the oxide under the air-blast, as indicated in the drawing. I fully expected to find that, as the oxide is fouled from below upwards, in the direction of the flow of the gas, the introduction of the air in precisely the same manner would lead to revivification in an upward direction, with the flow of air. But the very reverse took place—the air passing right through the whole bulk of material, and then revivifying from the top downwards. It was only after prolonged contact that any revivification was noticeable at the bottom, where the fresh air came into contact with the oxide first, and then only to a slight extent. In the middle space also, where air would be assumed to collect, not the slightest indication of revivification manifested itself until the top layer was wholly revivified; and then the action continued downward through the second layer, in like manner to the first.

Another important point which should be clearly understood is, that I could never discover any transition stage, as it were, or band of partially revivified oxide, between that already renewed and the foul material. Sections of the oxide taken at all stages revealed the conditions I have depicted in the drawing; the revivified oxide being in close contact with perfectly foul material. I wish it to be distinctly understood that each section represents the conditions over the whole box; the sharp line of demarcation extending horizontally with perfect uniformity right across. Repeated examination of the corners, middle, sides, and ends gave me the same result; no single instance occurring of greater penetration of the air in one part than another. This examination also disposed of the idea that once occurred to me—that the air had by some means taken a short cut through fissures in the oxide, or loose sides, and so found its way through to the top first. So that the only explanation of the phenomena that presents itself appears to rest on the assumption that some series of chemical reactions occur during the passage of the current upwards, unless it may be met by the simple fact that the air really does act equally throughout the oxide; but inasmuch as the oxide is the most fouled at the bottom, and is proportionately less so towards the top, the effect of revivification is seen to progress in apparently the reverse direction, from the top downwards through the material, requiring longer contact in proportion to the work it has done. In any future experiments that may be attempted, it might prove desirable to introduce air between the layers of oxide as well as below.

I trust it will be clearly understood, by those gentlemen who freely advocate the air process as ordinarily understood, that these remarks are not made in any sense of rivalry to that. Personally, I consider the ordinary air process of greater value than that put before you now; and the pure oxygen the best of the methods of dealing with our solid purifying materials. But for a time there are not likely to be many in a position to deal with oxygen; and although the ordinary air process will deservedly become more largely adopted than it is now, there will remain many hard-worked managers who, without skilled assistance, and unable to devote the necessary attention themselves, would fear to risk the introduction of either air or oxygen with the gas. To these especially, some such process as the one now before you, requiring, at the most, two or three hours' attention each time a box has to be renewed, ought to be of value.

Glancing for a moment at the question in its general aspects, we see that, being able to purify coal gas by contact with the solid material, oxide of iron, we effect this contact by bringing the gas to the solid body as a more expeditious and economical method than any attempt at a reverse order of things could possibly be. So far, so good. But this same solid material is capable of being again rendered fit for purification, not by the laborious application of other solids or liquids (when some excuse for the wasteful and costly system of its removal from the boxes would have existed), but by the simple application of another gas—oxygen—either in the pure state, or mixed with nitrogen as air. Why, then, having once practised economy, do we throw our ideas of economy to the winds—*i.e.*, the oxide to the air? I think this question cannot be answered without admitting the room for improvement, especially in these days of keen competition and high-priced, though uncertain, labour; and I feel sure that, in the near future, the use of solid materials for purification will only be tolerated in conjunction with some revivifying system which admits of its prolonged use without removal. This done generally will leave the gas manager one advantage the less to make use of to widen the gap between the industry he guides and its many competitors, but it will also be one step nearer that degree of perfection which it should be the aim of every man to reach.

Discussion.

The PRESIDENT remarked that they had listened to a paper bearing upon a subject that had occupied a prominent position lately, and on which almost all members could say something.

Mr. N. H. HUMPHRYS asked if Mr. Dexter had any idea of the volume of air passed through the purifier in the course of revivification.

Mr. A. THOMAS (Cowes) considered the paper an excellent one. He might remark that 30 years ago, Mr. J. Esson, of Cheltenham, tried some experiments on similar lines. The purifiers were on the overhead system; and a 9-inch pipe was laid to the inlet, and air was driven through it by an exhauster. He (Mr. Thomas) was foreman there at the time, and helped to put up the pipes; but he happened to leave for another appointment before the system was actually tried, and therefore he had never heard the results. The difference in pressure evidently had a great deal to do with the time required for revivification; and the greater the pressure, the more rapid the result. He would like to know if this held good up to the highest degree of pressure the purifier would stand, or, if not, the highest limit to which Mr. Dexter would be inclined to go. He would be glad if the result asked for by Mr. Humphrys could be arrived at; but the question

should be coupled with the weight of oxide acted upon. Some idea could then be formed as to the quantity of air required per ton of oxide; and then it would be a simple matter to arrange for the supply of this quantity.

Mr. RILEY thought the particulars given in the paper seemed to point to the fact that the actual volume of air passed through the purifier was of no practical consequence. The actual application was most simple. The purifier was shut off, the air-pipe connected, and air forced in at the highest pressure practicable. It was rather a question of the number of hours required for the revivification of a purifier than of the quantity of air admitted. The plan would be very useful in works where the purifiers were small in area; and he would be glad to know if it would be safe to increase the pressure, and so hasten the time occupied in revivifying, to a greater extent than Mr. Dexter had carried it. Referring to the third experiment carried out by the author of the paper, he asked if the narrow band of unchanged material shown in the drawing possessed any physical peculiarities—in other words, if the material was more dense or closely packed at that part.

Mr. BRIERLY thought the experiments described were of an interesting character, particularly with regard to the property of the material to revivify downwards. Every chemical association required a certain minimum of time for working. The greater the pressure, the greater would be the penetrating power of the air into the oxide. Another point was the effect of friction as regards the action at the bottom of the box, compared with that towards the top. Friction meant increase of temperature; and this, in its turn, meant greater chemical activity. The temperature would be higher towards the top of the box; and perhaps this was the reason of the more active operations that evidently prevailed there. As to the quantity of air required, this would depend not only upon the weight of oxide to be revivified, but also upon the efficiency, as shown by the percentage of oxygen actually absorbed, which could be ascertained by analyzing the air escaping from the plug; besides which there was the effect of pressure. Possibly a greater efficiency obtained at the higher pressure. The slower the velocity of the current of air, the smaller the percentage of unused oxygen that would escape.

Mr. A. STEPHENSON (London), in response to the invitation of the President, said that in revivifying *in situ* the real question was the percentage of sulphur contained in a combined form in the material; or, in other words, the percentage of sulphide of iron. An important consideration in connection with this matter was the liability of the oxide to heat during revivification. This varied according to the age of the material; and new oxide was more likely to fire than that which had been used for some time. Unless the air was admitted cautiously, the material would become hot, and the grids would be burned. He had known the plan described to be tried at several places, but rejected on account of this liability to heat. Then some preferred to admit a small percentage of air with the gas; and certain of his friends claimed to be able to use as much as 4 per cent. of air without spoiling their gas. But he thought in that case the air must be of very superior quality. He considered that Brin's oxygen process presented by far the best means of revivifying *in situ*. Perhaps Mr. Dexter could say something about the age of the oxide he used.

The PRESIDENT thought the meeting had heard a good paper, and some practical remarks upon it. He had had no experience himself in revivifying by blowing air through the purifier. It would be a good thing if some regular rule or plan for revivifying *in situ* could be arrived at; and the use of pure oxygen was certainly far in advance of air.

Mr. DEXTER, in reply, said that no doubt the question raised by Mr. Humphrys, and subsequently by Mr. Thomas, as to the quantity of air required, was interesting; but he did not think it was of any practical importance. No one ever troubled about the volume of air that came in contact with the oxide in the revivifying-shed. He had aimed at bringing the air to the oxide instead of taking the oxide to the air; and he really could not get at the volume of air sent through the purifier. As to the limit of pressure, he saw no reason why any pressure short of forcing the lutes should not be used. As already explained, he was unable to obtain a higher pressure with the blower at his command; otherwise he would have tried an experiment at 6 inches pressure. He did not think the friction between the air and oxide could be of much account, though the question of temperature was undoubtedly of importance. In the second and third experiments, although the pressure was greater, the actual velocity and quantity of air passed was considerably reduced. In reply to the question about the narrow band of black in the third experiment, he did not notice any difference in the hardness of the oxide at that point. Every chemical action required time; and at the highest pressure any given particle of air remained in contact with the oxide for the longest period. The percentage of sulphur in the oxide he used was 20; and it was raised up to 50 in the test-box by the repeated experiments. The tendency to heat was greater as the percentage of sulphur increased; and in the last few operations he had to reduce the velocity of the air, so as to keep down the temperature. The heating was entirely under control. No doubt it was possible to blow up the box, or set the whole on fire; but there was no need to do so. It was merely a matter of adjusting the air supply.

VOTES OF THANKS.

The PRESIDENT proposed a vote of thanks to the readers of papers. Although several well-known faces were missing, the meeting had not only heard good papers, but had interesting and useful discussions upon them. The gentlemen who had read the papers were especially entitled to thanks, because they had come at some personal discomfort, rather than disappoint the meeting.

Mr. J. NICHOLLS (Crewkerne) seconded the resolution, and it was carried with applause.

Mr. RILEY and Mr. DEXTER having briefly replied,

Mr. LYON said it was his privilege to propose—"That the thanks of the meeting be heartily accorded to the Directors of the Southampton Gas Company and Mr. C. Crowther Smith, the Secretary, for the kind and hospitable reception extended to the Association." He remarked that the resolution needed no words of recommendation from him.

Mr. A. THOMAS seconded the motion, saying that the Directors had supported the President, and treated the Association exceedingly well.

The proposition having been heartily carried,

Mr. C. CROWTHER SMITH, in replying, said that it afforded him great pleasure to know that the efforts of his Directors had been so successful. He did not believe there was a Board in the kingdom who more appreciated the valuable services of engineers and managers. The gas industry could not be carried on without practical and scientific support; and so long as this was forthcoming, he saw no cause for fear in the competition or other difficulties with which it was threatened. With such interest and desire to promote its prosperity as that exhibited by the Association, he was warranted in believing it to be perfectly safe. It afforded him great pleasure to meet the Association, and he hoped that when they again visited Southampton they would come in greater numbers.

Mr. RILEY proposed a vote of thanks to the President, which was seconded by Mr. FAULKNER (Romsey), put to the meeting by the HONORARY SECRETARY, and carried with applause.

The PRESIDENT briefly replied, and the meeting closed.

Before leaving, the members were served with tea, &c., by the kindness of the Directors of the Company.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

The Twenty-first Annual Meeting of this Association was held at Boston on the 18th and 19th ult.—Mr. Chas. F. Prichard, of Lynn (Mass.), occupying the chair.

In commencing his Inaugural Address, the President observed that they now celebrated the 21st birthday of the Association; and that it had increased from 23 up to 150 members. It was the oldest Gas Association, and one of the oldest technical societies in the States. As a means of overcoming the difficulty of obtaining papers for the meetings, he proposed that a small Committee should be formed at each meeting to look up suitable subjects, and to select members best qualified to write papers upon each question. Referring to the manufacture of gas, he thought it was clear that a generator furnace, with a moderate amount of recuperation, was best suited to their requirements. Also that time and velocity of flow were important factors in successful condensation and purification. He spoke with much satisfaction of the increasing value of coke, ammonia, and tar; but against this, coal, besides being high in price, was poor in quality, though rich in sulphur. Notwithstanding the repeal of the carbonic oxide law in Massachusetts and the cheapness of naphtha and oil, water gas was not largely adopted, although its advantages as an auxiliary and otherwise were well known. The water-gas apparatus to-day was greatly superior to that of ten years ago. In spite of competition of various kinds, the market value of gas securities had improved during the year. Referring to the question of municipal authorities becoming proprietors of gas-works, he mentioned the frequent occurrence of the mistake of supposing that the only items of expense in gas making were the materials and labour; and also deprecated the comparison of American with European prices. Give any member of the Association labour at English prices, and apparatus and supplies furnished by labour at these prices, and it would be an easy problem to furnish gas at English prices. If the gas and electric companies of Massachusetts only earned an average dividend of 6 per cent., as was shown in the Commissioners' reports, where was the margin for municipalities, burdened as they must be with several disadvantages, to work such concerns on borrowed capital at a profit. As regarded electric lighting, he thought that the incandescent lamp, though it would not be a destroyer, would become a competitor with illuminating gas; and he urged the importance of increasing the quality, reducing the price, and cultivating the fuel business. Gas, electricity, and oil were now all within the means of the average consumer; and price was a powerful argument for or against either. It was shown before the Association five years ago that ordinary coal gas at reasonable rates was cheaper than fuel gas at one-half its then price; and the argument was as true to-day as it was at that time. Nothing new had been developed in fuel gas, unless it be negative results as to its commercial success.

Mr. G. F. Goodno, of Dedham (Mass.), read a paper entitled "Some Experiments on the Rate of Purification." Foul gas

was, he said, passed at various rates through a small experimental purifier, capable of holding one-tenth of a bushel, and charged with iron sponge. The speed was gradually increased until a foul test showed at the outlet, which was found to occur when the quantity of gas exceeded 60 cubic feet per hour. Reducing it again to 3 cubic feet per hour, the supply was increased at regular intervals to 10, 15, 24, 30, and 40 cubic feet per hour, when the foul test again appeared. The flow was then put back to 6 cubic feet per hour; and it was allowed to remain at that until the foul test again appeared, when about 300 cubic feet had been passed. Examination showed that the oxide was not entirely saturated, as might be expected from the fact that it was in regular use on the works, and purifying about 5000 cubic feet per bushel, with a velocity of 23 cubic feet per bushel per hour. These observations would account for the fact of a box showing a foul test before it should be expected, or of a foul test showing one day and disappearing the next. In the author's works the flow of gas ranged from 12 cubic feet per bushel per hour in June, to 28 cubic feet in December. The experimental purifier was then charged with lime, moistened and mixed with breeze, and gas passed at the rate of 66 cubic feet per hour. Whereas with the oxide this quantity gave a foul test at once, it did not do so for an hour with the lime. The flow was reduced to 60 feet per hour, when the foul test gradually disappeared, and did not show again till 200 cubic feet of gas had been passed. The lime was well fouled round the sides, but quite white in the centre part; so that the gas had apparently forced through the sides without touching the centre. He understood from others that the amount of gas purified per bushel of lime was pretty much the same in summer and winter. These experiments were important in connection with the manufacture of water gas, where a rapid flow of gas was produced at intervals. They showed that smaller boxes might be used with lime than with oxide, and that for the latter material the capacity should not be less than 2½ cubic feet for each 1000 cubic feet of gas made per diem. It might well be nearly double that proportion.

Mr. Allyn said that his purification would go on well for a while, and then suddenly there was a kick. At times of maximum production, he experienced some trouble from the formation of a shell or thick crust on the under side of the purifying material; and this would occasionally form in a few hours. It would not be more than perhaps half-an-inch thick, but still so impervious that the pressure went up, and they had to change the box. This had happened with new as well as old material. Thinking it might be due to naphthalene, he had tried naphtha in the purifier; but that had no effect. His purifiers were 20 feet square, and were charged with 400 to 500 bushels of oxide; and the quantity of gas purified per bushel ranged from 25,000 cubic feet in summer to 5000 feet in winter. Mr. E. C. Jones had found that by putting in larger purifiers, the work per bushel of material was largely increased, showing the correctness of the views advanced in the paper. He had been troubled, like the previous speaker, with increase of back pressure, sometimes a few hours after turning on the purifier. Thinking this might be due to naphthalene, he had adopted the plan of working his exhauster so as to draw gas rapidly back through the purifier, and this was a partial remedy. Mr. Slater supported the facts advanced in the paper. Mr. Coffin had trebled the size of his boxes, and thus doubled the duty obtained. Using Pennsylvania coal, he purified over 10,000 cubic feet per bushel. Mr. Nettleton had experienced not only 12, but up to 20 inches back pressure. He obtained some relief by mixing chips with the lime. Mr. Sherman said that, when he introduced the manufacture of water gas, one of the first difficulties was the back pressure in the purifiers. It would go up 20 inches in a day. He found the use of a layer of sawdust a satisfactory remedy.

Mr. N. W. Gifford, of New Bedford (Mass.), followed with a paper entitled "Trouble in Purifying Gas from Sulphurous Coals." His make of gas, he said, was 160,000 cubic feet per day, and the gas passed first through 140 feet of 12-inch pipe, then through the exhauster, a Pélouze and Audouin condenser, an upright condenser, and a Standard washer-scrubber. There were four purifiers, each 8 feet by 13 feet in area. He was obliged last winter to use Glace Bay, Scotia, and other kinds of Eastern coals; and these necessitated frequent changes of purifiers to keep a clean test, the sulphur compounds running very high. A small purifier filled with clean lime at the inlet of the sulphur apparatus made no difference; but when foul lime was substituted at the bottom, with a layer of clean lime on the top, only a very small quantity of sulphur passed. He could not understand why the foul lime in his boxes would not absorb the sulphur compounds—especially as the coal required twice as much material as that formerly used. Some of the coal contained quite 5 per cent. of sulphur; so there appeared to be enough sulphuretted hydrogen to secure the absorption of a large amount of carbon disulphide.

Colonel Benson said he had used some Province coal; but had not experienced any of the troubles narrated in the paper. Some time ago, he was troubled with back-pressure; and that led him to adopt the plan of turning off a purifier so soon as it had passed a certain quantity of gas, whether it showed a foul test or not. Mr. Wood had fared nearly as badly as the reader of the paper. He used two parts of Province coal to three of Pennsylvania coal, and once had to change five purifiers one day. The purification per bushel went down from 2100 to 700 cubic feet; and when he dropped the Province coal, it went back to 1800 cubic feet. Mr. Sherman had used some Province coal and found that the gas from it contained 80 grains of bisulphide per 100 cubic feet, and led to complaints all over the district. As regards lime *versus* oxide, he thought the introduction of cheap Lima oil would lead many to revise their views on the matter. Mr. Nettleton thought further information as to the proportion of sulphur compounds in American gas was very desirable. Mr. Greenough said that the State Inspector for Massachusetts had made a great many experiments on that point; and he found that ordinary American coal, purified in the usual way, gave 12 to 14 grains of sulphur per 100 cubic feet of gas. The English gas companies had a great deal more sulphur in their coal than they did. Mr. Rogers used lime exclusively; and purified 7000 to 8000 cubic feet per bushel in summer, but in the winter it went down to 5000 feet. The discussion here drifted away to the comparative cost of lime and oxide purification, and also the effect on the illuminating power. As to the effect of oxide on the quality, there was a variety of opinion. Some urged that there was no practical difference. Mr. Lamson mentioned that the State Inspector was desirous of adopting a flat-flame for the standard burner in place of the Argand. If this was done, the gas would have to be free from carbonic acid. Although gas purified through oxide might appear as good in the Argand burner, it would not in the flat-flame. Mr. Sherman said that the flat-flame gave better results than the Argand with water gas.

(To be continued.)

REGISTER OF PATENTS.

Manufacture of Illuminating Gas.—Mannesmann, R., of Landore, South Wales. No. 1237; Jan. 23, 1890. [8d.]

In alluding generally to his invention, the patentee remarks: The usual method of producing illuminating gas from coal requires apparatus of considerable size, and involves great cost of production. The cost of the gas is thus out of all proportion to that of the coal used for manufacturing it. The present invention has for its object therefore to greatly reduce this disadvantage by doing away with the existing method of heating the retorts externally; and, in lieu thereof, effecting the direct heating of the coal from within the retorts by burning a portion thereof, and storing up the heat generated in the incandescent coke, the heat of which is transmitted by means of a portion of the produced gas itself to the fresh gaseous coal—the illuminating gas being thus made to act as a conveyor of heat.

For carrying out this process, a vertical retort or producer may be employed, provided with a closing device at the top end, through which it is charged with coal. The lower end of the producer is furnished, as usual, with an ash-pit; while a channel leads from the lower end, communicating by a regulating valve or slide with the upper part of the retort or producer. All the openings and passages are provided with valves, by means of which they can be closed.

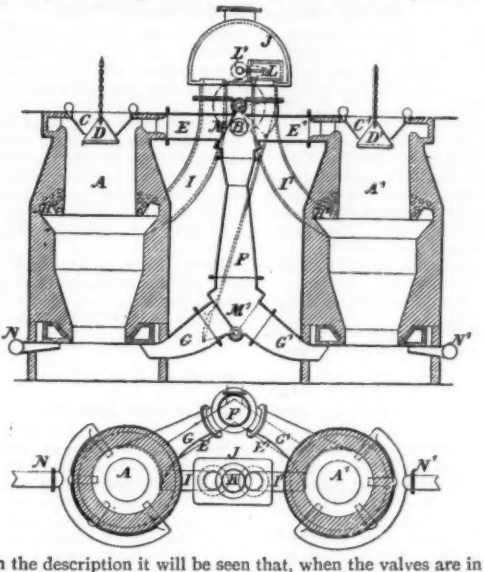
After the retort is charged with coal, and ignited at the lower end, air is periodically admitted to the ash-pit; and at the same time the flue leading to the chimney is opened. The fire consequently extends upwards, converting the lowest part of the charge into incandescent coke. The air supply to the ash-pit is then closed, as is also the chimney flue; and the gas outlet and the communicating channel between the upper and lower end of the producer are opened. Whereupon a circulation of a portion of the gas produced is caused to take place by means of a fan, injector, or other propelling apparatus through the communicating channel in the direction from the top to the ash-pit; and by this means a portion of the illuminating gas is forced to pass through the incandescent coke. In this way it is made to take up heat therefrom; and, in ascending, it gives off the heat again to the upper cold part of the charge—thus heating the same, and eventually distilling off the volatile constituents. A portion of the gas thus produced is again drawn off, as before, for effecting a second circulation for the transmission of heat from the coke into the upper part of the charge; while the remaining portion is led off into the gas-main, and is there cooled and purified in the usual manner. By means of this circulation of gas, a further quantity of the coal is converted into coke; and the coke which was previously incandescent is partially cooled.

The above operation is then repeated. The gas outlet and the communicating channel are first closed, and then air is admitted to the ash-pit, and the chimney flue is opened. The lower part of the generator charge is thus once more rendered incandescent; and the heat thus accumulated is then again transferred, by the circulation of the illuminating gas, to the fresh coal at the top, as already described.

Fig. 1 [see next page] shows a vertical section, and fig. 2 a sectional plan of an arrangement of the apparatus.

Two retorts or producer chambers A A^1 are employed in combination with one and the same gas-main B, and the chimney flue K; the gas producers being so arranged that, while in one of them the one stage of the operation is being carried out, the other stage is being carried out in the other producer. The charging-hopper C C^1 for feeding fuel periodically into the producer is closed by a valve D D^1; and the upper end of the producer communicates by a branch tube E E^1 with a tube F common to both producers, and communicating at its lower end by two branches G G^1 with the ash-pit or lower end of the producer. At H H^1 the producer has an annular cavity, which communicates by a tube I I^1 with a valve chamber J, communicating by a pipe K with a chimney flue. The openings of the tubes in the valve chamber are controlled by one and the same valve L, carried by an arm L^1, which in one position closes the communication between the producer A^1 and the chimney flue K (as shown by the drawing), leaving the communication between A and the chimney open; while, when in the opposite position, the valve closes the communication between A and K, leaving that between A^1 and K open. In the tube F are arranged two flap-valves M M^1, mounted on spindles, by turning

which they are made alternately to open communication between A^1 and the tube F, as also with the gas-main B, and to close the communications with A (as shown by the drawing); while, in the opposite position of the valves, the communications will be reversed. N N^1 are pipes leading air under pressure to the lower ends of the producers.



From the description it will be seen that, when the valves are in the position shown in the drawings, air is being supplied through N to the bottom of producer A—this being, at the same time, in communication with the chimney flue K. In producer A^1, on the other hand, the air supply and chimney draught are cut off; and the gases given off from the top of the producer are partly made to circulate through the tube F to the bottom of the producer by means of an injector or other propelling apparatus (not shown); while the other portion of the gas produced is led off into the main B. After a certain time, the valves are reversed, so as to change the operations in the two producers.

Gas Producers.—Imray, O.; a communication from R. and M. Mannesmann, of Remscheid, Bliedinghausen, Germany. No. 1285; Jan. 24, 1890. [6d.]

The products from gas producers as generally employed, remark the patentees, contain a mixture of tar and other heavy hydrocarbons, which are readily precipitated in the passages, and thereby interfere with the draught and at the same time render the gas more impure. The present invention therefore relates to the construction and mode of working gas producers in such a manner that the heavy hydrocarbons are converted into permanent or light hydrocarbons, which, in mixing with the products of the gas producer, enrich them and pass together with them through the gas passages without leaving any precipitate.

For this purpose, the gas producer (which can otherwise be constructed in the usual manner) has fixed on the top of it a pipe which can be closed at the top by a suitable valve or other mechanism; and from the upper end of this pipe below the closed head, a communicating passage passes to below the ash-pit or to the lower part of the generator. In this passage is arranged a propelling appliance—such as a steam or air injector or fan—which draws a portion of the gaseous products in the producer through the upper tube, then laterally downwards through the communicating channel, and then blows this current of gas into the lower part of the producer or into the ash-pit. The heavy hydrocarbons are thereby distilled off from the upper part of the coal, and are passed under the incandescent fuel in the lower part of the generator. By the great heat which exists there, these gases are decomposed; and the liberated solid carbon adheres to the separate pieces of coke, or it combines with the oxygen, while the permanent gas with the other gaseous products passes into the gas-flue. The movement of the air current can be effected by mechanical means—as, for example, fans, blowers, &c.—or preferably by a current of highly compressed air or a steam-jet. In the latter case a portion of the steam thus introduced into the fuel is converted into water gas, which mixes with the other gaseous products.

Regenerative Gas-Lamps.—Bower, G., of St. Neots. No. 6796; May 2, 1890. [8d.]

This invention relates to the class of regenerative gas-lamps wherein the flame is of a bulbous or spreading character; and it may be used with a gas-burner presented either downwards or upwards.

When the burner is presented downwards, it consists of a metal portion having at its lower end a flange, and inside a screwed collar. A steatite burner proper is screwed at its upper part into the space between the flange and collar, and firmly fixed therein, so that it is not liable to split. The burner proper is hollow to receive the gas; and it is closed at the bottom, and has orifices or a slit around it for the outlet of the gas to be burnt. Or it may consist of a chamber secured to the lower end of the gas-pipe, and preferably of an elliptical or acorn shape, and having at its lower end an opening through which projects a central cone with a space between itself and the opening for the gas to issue. This chamber is preferably made in halves secured together; and there is a perforated or reticulated plate to support the cone and aid in the diffusion of the gas as it passes into the lower part of the chamber. The inwardly curving walls of the chamber cause the gas to issue in a thin sheet; and this insures a continuous sheet of flame when ignited. Immediately above the burner is fixed the regenerator, which consists of top and bottom plates connected by short tubes for the passage of the products of combustion; the air entering between, and being heated by, the outer surfaces of these tubes or passages. Thence it passes into a central chamber, terminating in a nozzle or short tube formed with, or removeably secured to, the regenerator, and having inwardly curved sides by which the hot air is directed from the nozzle or tube on to the upper side of the flame. There are wire gauze or perforated sheets round the outside of the regenerator—preferably one piece wrapped closely around the outside of the series of tubes, and the other situated a short distance therefrom between the regenerator and the outer casing or hood of the lamp. There may also be gauze or perforated plates in the air-supply passages from the regenerator to the flame. The flame is enclosed in a glass of a basin shape held in position by a flange formed on its upper edge, resting upon an annular ring jointed to the regenerator portion of the lamp and held up, or released for lowering, by means of any suitable fastening. The glass has at the bottom a central air passage of a bell shape, and turned up into the inside of the glass. This air passage is provided with a disc of perforated or reticulated material, for the purpose of heating the air supplied to the under side of the flame. The disc is secured in position by a central rod and nuts, or it may be formed in one piece of glass or other material.

When the burner is presented upwards, the gas-pipe is led down, and then turned up into the central inwardly-turned part of the glass; the pipe being jointed at the hinge upon which the glass and its support turn, and there constituting a cock for cutting off, and again establishing the gas supply as the glass and its adjuncts are turned downwards and upwards. The hinge will preferably be arranged so as not to wholly cut off the supply of gas. The other parts are like those already described.

Charging Gas-Retorts.—Eitle, C., of Stuttgart, Germany. No. 17,921; Nov. 7, 1890. [6d.]

This apparatus, for facilitating the charging of gas-retorts, is shown in the accompanying illustrations; figs. 1 and 2 being respectively a side and back elevation of the machine, and figs. 3 and 4 separate views of the charging apparatus.

Fig. 1.

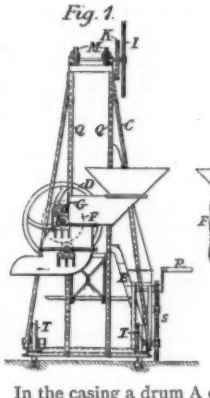


Fig. 2.

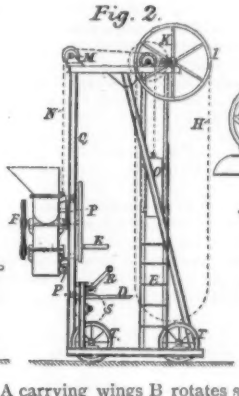


Fig. 3.

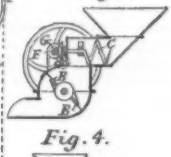
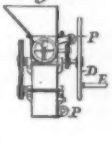


Fig. 4.



In the casing a drum A carrying wings B rotates so as to impel the coal supplied to it into the retort to be charged. The wings B first impel the coal to the back of the retort; and then (with the continuous supply of material, adjustment of the height of casing, and regulating the velocity of the wings) small and large coal "is so delivered towards the front of the retort that, in the whole length of this latter, the bed of coal is formed of perfectly equal depth"—it being characteristic of the machine that the bed of coal will not exceed a height greater than the upper surface of the outlet of the casing. All that is required is to adjust the height of this latter according to the desired depth of the charge. The hopper is shown ready for the reception of the charge of coal, which passes thence to the end of a revolving open spiral or worm C, so that this is not pressed down with the whole weight of the material. The spiral, winding easily through large and small coal, delivers it in proper quantity to the casing and revolving wings B; and the quantity of coal periodically delivered by the spiral is in proportion to its pitch. When its periphery reaches the discharging point, the coal is intermittently delivered; and this delivery, repeated at every revolution, allows the wings B sufficient time to arrive behind the delivered coal, and forward it without any clogging or stopping up. Upon turning the wheel D from the handle E, the wing drum and spiral are caused to rotate through the action of spur-wheels F and bevel-wheels G. On the frame of the machine, the mechanism for raising and lowering the charging apparatus is mounted. It consists of a hand chain H, chain wheel I, toothed wheels K, chain rollers M, load chain N, and weight O, by which the charging apparatus is balanced—the weight of the coal only having to be overcome by the hoisting mechanism. The charging apparatus is held upright by means of rollers P, running upon and guided by the uprights Q. The machine may be moved on rails by means of the crank handle R in connection with toothed wheels S and flange wheels T.

Charging Inclined Retorts.—Van Vestraut, L., of Southall. No. 20,030; Dec. 9, 1890. [8d.]

This invention relates to apparatus for charging inclined gas-retorts by the use of a shoot, which can be adjusted to any length and in such a position as to conduct the coal from a supply above to the mouth of any one of the group of retorts.

For this purpose, at a convenient height above or below the retort mouths, there is a frame or carriage that can be moved on rollers horizontally along rails; and from this carriage there is suspended a tubular shoot of any length or section, and at the base of the shoot is attached an adjustable shoe, bend, or scoop, of suitable shape. When it is desired to charge a retort, its mouth is opened; the carriage is run along the rails until the shoot comes vertically over the retort mouth; the

shoe, bend, or scoop is adjusted to the mouth; and thereupon coals can be delivered into the upper end of the shoot so as to descend it into the retort.

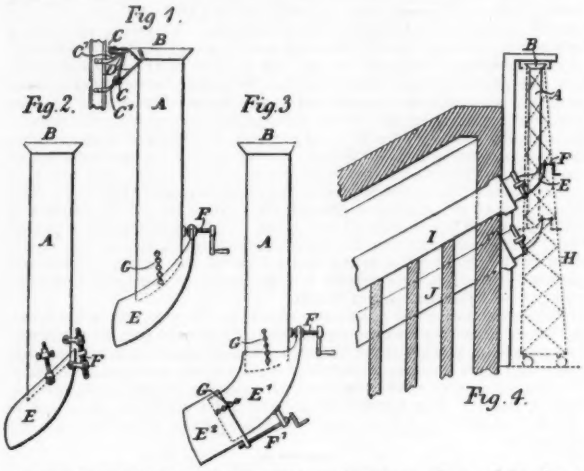


Fig. 1 is an elevation of the shoot with a shoe; fig. 2, of the shoot with a scoop; and fig. 3, of the shoot with a bend, and telescopic apparatus attached to one end of the bend. Fig. 4 is a part vertical section showing portions of two inclined retorts, to the charging of which a shoot is applied.

The shoot as shown in fig. 1 consists of a tube of any suitable section in one length A with a mouthpiece B, carried by a carriage D having rollers C, which run along rails C^1. At the base there is a curved shoe E supported by a chain G on each side and the screw F, which can be adjusted so as to direct the coals as desired into the mouth of any retort. The shoot as shown in fig. 2 consists of a tube A with a mouthpiece B and a curved shoe or scoop E hinged to the tube A, with an adjustable screw F. In fig. 3, the shoot A is shown with a bend E^1 supported by a chain G on each side and the adjustable screw F. A telescopic apparatus E^2 is attached to the bend E^1 at the extreme end by a chain G on each side of the bend E^1, and an adjustable screw F^1, which can be justified so as to direct the coals as desired into the mouth of any retort.

In fig. 4, the shoot is shown in position for charging the uppermost (I) of a row of inclined retorts; the dotted lines indicating a longer shoot to charge a lower row of retorts J.

The retorts being arranged in several vertical rows, the shoot can be moved by running the carriage D along the rails so as to come immediately above a retort; the shoot being made in various lengths to suit each row of retorts.

The shoot may be suspended from a frame (indicated by the dotted lines H in fig. 4), which can be run along the ground or on rails carrying the shoot with it.

APPLICATIONS FOR LETTERS PATENT.

4862.—Lindemann, O., "Improvements in gas and petroleum engines." March 18.

5072.—Lanchester, F. W., "Improvements in gas-engines." March 21.

5158.—Vanduzen, B. C., "Improvements in gas and gasoline engines." March 23.

5207.—Thorp, T., and Marsh, T. G., "Improvements in the purification of gas." March 24.

5212.—Munns, W. H., "Improvements in the art of manufacturing illuminating gas." A communication from E. de Beauharnais. March 24.

5213.—Fielding, J., "Improvements in gas motor valve apparatus." March 24.

5217.—Key, J. T., "Improvements in the manufacture of gas for illuminating and other purposes and apparatus therefor." March 24.

5226.—Lanchester, F. W., "Improvements in the valve and other arrangements of gas-bags for gas-engines." March 24.

5250.—Love, H., and Priestman Bros., Limited, "Improvements in or applicable to motor engines operated by the combination of hydrocarbon vapour or gas, and by the expansion of readily-liquefiable gases." March 24.

5299.—Thwaite, B. H., "Improvements in the production of combustible gases, and in apparatus therefor." March 25.

5300.—Tomes, G. B., "Improvements in recording the levels of liquids in sewers, drains, reservoirs, at outfalls and the like, and in recording apparatus." March 25.

5358.—Delepine, S., and Gomess, A. F. B., "A new method of and apparatus for the removal of smoke from chimneys for the purpose of preventing contamination of the air by the products of combustion, or of removing these products after they have become mixed with the air, so as to prevent the production of so-called yellow and black fogs; part of which apparatus is also applicable for collecting the carbon from gas and other lights." March 25.

5378.—Brownhill, R. W., "Improvements in means or apparatus for the automatic sale and delivery of gas and liquids on prepayment by coin or equivalent." March 26.

5417.—Adkins, W., and Melville, J., "Improvements in gas lighting and extinguishing apparatus." March 26.

5468.—Wilson, W. H., "Improvements in or connected with the manufacture of illuminating gas." March 28.

5489.—Mackay, M., "Improvements in purifying gas and in apparatus therefor." March 28.

5490.—Higginson, J., jun., "Improvements in gas-engines." March 28.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Walker's Over-Ground Gasholder-Tank.

Sir,—In looking through the issue of the Journal for March 31, I see that Messrs. C. and W. Walker, of Finsbury Circus, have recently taken out a patent for a gasholder-tank built over ground, and whereby the space under the tank may be utilized for storeage purposes.

It appears to me that this is precisely similar to the plan of Professor Intze, of Aachen. A few years ago Professor Intze read a paper on the subject before The Gas Institute; but there was no discussion, and the matter appeared to attract little attention. Since then many holders on the Intze principle have been erected in Germany; and last year I erected a telescopic holder on the same principle at our Flensburg works. The result is a great success; and the space under the tank is very useful.

It is curious to see English engineering firms slowly awakening to the advantages of the system; but it is still more curious to observe the calm manner in which Professor Intze's patent is ignored.

F. D. Marshall.

Danish Gas Company's Offices,
Copenhagen, April 2, 1891.

Conferring Favours at Your Own Expense.

Sir,—Some time since I brought out, for local use, a leaflet entitled "Neighbourly Gossip about Gas and Oil," which you favourably noticed at the time. Since then I have received applications for copies from all parts of the country. These I gladly sent, when a stamped envelope or wrapper was enclosed; but in dozens of instances this was not done, and, on principle, I declined to confer the favour asked. To-day I have received a letter from New Zealand, asking for a copy of this leaflet. I had 1d. to pay, owing to the letter being understamped; and if I had complied with the careless writer's request, I must have paid 2½d. more as the cost of doing him the favour asked. I think, however willing a person may be to do a kindness to another in the same profession, he ought not to be taxed in this way from the thoughtlessness of his correspondents.

A. W. Marks, Secretary.

Sheppy Gas Company, April 2, 1891.

[We cordially endorse the closing sentence of our correspondent's letter. Similar instances frequently occur in reference to inquiries—in many cases troublesome ones—addressed to us; and therefore, we have special reason to agree with him that the practice he refers to should, on principle, be brought under the notice of thoughtless people.—Ed. J.G.L.]

Testing Cements.

Sir,—I have read with interest the account of M. Deval's experiments, published in the Journal for the 31st ult. The results he has arrived at are not new, as I made similar tests some five years since; and after many careful experiments, I found the results obtained most unreliable.

I believe it will be acknowledged that Portland cement, after being gauged into briquettes, should be placed in a bath at the same temperature as when it is used for the purposes intended. Portland cement being such an important commodity, it is very essential that true tensile tests are obtained; and if a 28-days' test result was acquired after a 7-days' gauging, very grave doubts would arise as to whether it had been overlimed. High tensile tests obtained after 7 days' gauging invariably show that the cement has reached its maximum strength and generally deteriorates; whereas a low-tensile test—*i.e.*, 350 lbs. per square inch average—is a fair test, and has a greater chance in increasing its value. The "hot test" may save time; but this is of very little importance. Portland cement should be properly tested, and the test results known, before purchasing. This would then prevent cement being sold that is unfit for use.

W. T. Parrack.

Queen Victoria Street, E.C., April 3, 1891.

The Electric Lighting Plant of the Anglo-Romano Gas Company.—Our readers are aware that the Anglo-Romano Gas Company have in operation a large installation of electric lighting. It consists of four dynamos driven by engines of 600-horse power each, two dynamos with engines of 150-horse power each, and one with an engine of 50-horse power; three exciters, driven by engines of 40-horse power each, steam being supplied by 14 boilers of 164-horse power each. The concentric high-tension cables used are 19,750 metres in length; and at the end of last year there were 143 transformers in use. The total number of lamps installed at the same date amounted to 11,156, of various powers, equal to 16,508 normal 16-candle lamps. There was an increase of 3478 lamps of various types, equal to 6051 normal 16-candle lamps, during the past year. This is believed to be one of the finest central stations on the alternate-current system.

The Water Supply of Coventry.—The most important matter dealt with at the meeting of the Coventry City Council last Tuesday related to the water supply of the city. The Water Committee recommended the acceptance of the tender of Messrs. Cochrane and Co., of Dudley, to supply cast-iron pipes for the water-main from Whitley to Barker's Butts. Alderman Read, in moving the adoption of the report, said that there was danger of the city being short of water in the ensuing summer. Mr. Andrews opposed the Whitley scheme, on the ground that there was danger of the water becoming contaminated with sewage from the Corporation filter-beds, and said Mr. De Rance, the geologist, confirmed him in his opinion. He indicated the Upper Sherborne and Sowe Valley as alternative sources of supply. Alderman Tomson replied that the Committee were in the hands of Mr. Hawksley, who had guided the city in these matters for forty years. The report was adopted.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS PROCEEDINGS ON PRIVATE BILLS.

The Progress Made during the Session to Easter.

Down to the rising of the House for the Easter recess, the following progress had been made with Private Bills that originated in the Lower House and some already passed by the House of Lords. Those not named, in which our readers are specially interested, are still going through their various stages in the Upper House.

Read the third time: Bognor Water Bill; Leighton Buzzard Gas Bill; Llanelly Local Board Water Bill; Market Drayton Water Bill; Rhyl Gas Bill; Stourbridge Improvement Commissioners' Bill.

Reported from Committees: Fylde Water Bill; Garw and Ogmore Gas Bill; Sunderland and South Shields Water Bill; Western Valleys (Mon.) Water Bill.

Read a second time: Falmouth Water Bill; Penmaenmawr Local Board Bill; Southwark and Vauxhall Water Bill; Stourbridge Gas Bill.

Read the first time: Bristol Gas Bill (Lords); Croydon Water Bill; Filey Water and Gas Bill (Lords); Malvern Water Bill (Lords); Mountain Ash Local Board; Newark Corporation; Troon Water Bill (Lords).

The Bills originating in the House of Lords, and which have not so far reached the House of Commons, are: Alloa Water Bill; Brentford Gas Bill (withdrawn); Dundee Water Bill; Gaslight and Coke Company Bill (withdrawn); Glasgow Corporation Bill; Kettering Gas Bill; Lynton Water Bill (thrown out); Northallerton Water Bill; Partick, Hillhead, and Maryhill Gas Bill.

Petitions against the following Bills were presented during the recess:—

London Water Commission Bill, from the Tottenham Local Board of Health.

Malvern Water Bill, from the Malvern Hills Conservators.

HOUSE OF LORDS COMMITTEE.

Friday, Feb. 27.

(*Before Lord* NORTHINGTON, *Chairman; Earl* DUNDONALD, *Lord* DE ROS, *Lord* COLCHESTER *and Lord* SETON.)

NORTHALLERTON WATER BILL.

This Bill, the object of which is to authorize the Northallerton Local Board to construct water-works and supply water within their district and the townships of Brompton and Romanby, and to borrow £14,000 for the purpose, came before the above-named Select Committee to-day.

Mr. LITTLER, Q.C., and Mr. FREEMAN appeared for the promoters; Mr. BIDDER, Q.C., Mr. BALFOUR BROWNE, Q.C., Mr. DENT, Mr. LEWIS COWARD, and Mr. C. BAGGALLAY represented the various petitioners against the Bill.

Mr. LITTLER opened the case for the promoters, and fully explained the purpose of the Bill. He concluded by objecting to the *locus standi* of the Thirsk Water Company as petitioners against the measure.

Mr. BAGGALLAY, in supporting the petition of the Company, said that it was a limited liability undertaking, which was empowered by a Provisional Order granted in 1879, and also by its Memorandum of Association to supply water in Romanby and Northallerton, and was therefore entitled to be heard, if only on the ground of competition.

The Committee, after consultation, decided to allow the *locus* of the Company.

Mr. *C. Waistall*, Chairman of the Northallerton Local Board, said that at present the water supply of the town was very bad. It was derived from shallow wells, most of which had been condemned by the Medical Officer of Health. The Board proposed to take the water from the Jenny Brewster Spring; and the total estimated cost of the scheme was £15,000, the money for which they would be able to borrow at 3½ per cent. There was no objection raised by the inhabitants of Romanby and Brompton to the proposal to include them in the scheme.

In cross-examination by Mr. BALFOUR BROWNE, on behalf of certain mill-owners and others on the Codbeck, witness admitted that the Board had power to purchase water in bulk from the Thirsk Water Company, which was only 100 yards from their border. The scheme would certainly involve an increase in the rates; but he would not like to say how much it would be. Thirsk was rather larger than Northallerton; and the cost of the Company's works was about £32,000.

Mr. *A. M. Fowler*, C.E., said he had had considerable experience with water-works. The population of Northallerton and the district of supply was 5200. The Local Board proposed to collect the water from five springs flowing into the Oakdale Beck and from the beck itself, at a point seven miles from the town. The water was springing from the rock, and was of a very pure description. The gathering-ground of the five springs was 166 acres; but he did not propose to depend on this at all, but on the springs. The supplying capacity of the proposed reservoir was 336,000 gallons per day. The surface would be at an elevation of 215 feet above, and 1 mile 30 chains from the town. This would give a pressure of 86 lbs. per square inch for the reservoir when holding 200,000 gallons of water. In order to supply the mill-owners on the beck, the Board proposed to construct a compensation reservoir at Oakdale, which would contain 4,800,000 gallons. The gathering-ground was 1234 acres; and this reservoir was capable of an increase by 1,500,000 gallons, which would give 6,300,000 gallons of compensation water to the mill-owners, if needed. Then, by raising the water-level 6 feet, it would give them a capacity of 11,300,000 gallons. The longest period estimated now for a drought was 120 days; and the quantity of compensation water provided for would furnish a supply of 45,700 gallons to be sent down the beck. Half an inch of rainfall on the area would contribute 15,000,000 gallons of water. He considered that the quality of the water the mill-owners would get would be considerably improved by allowing for subsidence in the reservoirs. His estimate for carrying out the scheme was £13,500, which was based upon his experience in connection with undertakings of a similar kind on which he had been engaged.

In cross-examination by Mr. COWARD, on behalf of the mill-owners, witness admitted that the promoters would be entitled by the Bill to take 120,000 gallons of water a day, and were providing to send back 45,700 gallons. If they raised the reservoir 6 feet, they could send down 107,600 gallons; but in order to send the 120,000 gallons, they would require to raise the reservoir 7 feet, and to excavate the ground beneath it. He was quite willing that it should be made compulsory to raise the reservoir so as to provide the requisite quantity of compensation water, and that there should be a penalty if the Local Board did not furnish it.

Mr. FREEMAN said this was a matter of arrangement. If Mr. Coward would propose a clause, the Board or their Counsel would be ready to consider it; but the Engineer had no power to bind the Board in this matter.

At this stage of the proceedings, it was stated that a clause had been accepted by the promoters relative to the supply of water to the North-Eastern Railway Company. It was to the effect that, notwithstanding anything contained in this Act or in the Thirsk Act of 1879, the Thirsk Company should be entitled to continue to supply water to the Railway Company within the district of supply of the Local Board, until such time as the Board proved to the reasonable satisfaction of the Railway Company that they were able and willing to supply permanently such suitable water as was required by that Company, at a price not exceeding that paid to the Thirsk Company during 1890; and if at any time the Board were unable to afford such supply, it should be lawful for the Thirsk Company to supply the Railway Company as heretofore.

Mr. *W. Stead*, M. Inst. C.E., of Northallerton, County Surveyor for the North Riding of Yorkshire, gave confirmatory evidence as to the unsatisfactory condition of the present water supply, and to the desirability of adopting the proposed scheme. He estimated that a rate of 1s. in the pound would pay off the cost in 50 years; the rateable value of the town being £12,800. If they took a supply of water from the Thirsk Company, there would still require to be a 1s. rate; and at the end of 50 years, they would have no water-works.

Mr. *T. Fairley*, Analytical Chemist, of Leeds, gave evidence as to his analysis of the water of the five springs proposed to be taken, and said he found it soft and pure. His tests of the water in the wells of the town showed that it was quite unfit for a domestic supply.

This closed the case for the promoters.

Mr. *A. E. Preston*, M. Inst. C.E., of Bradford, was then called, and examined by Mr. BAGGALLAY on behalf of the Thirsk Water Company. He said that Romanby required no water supply further than that given by the Thirsk Company, which had an ample service. They could supply to Northallerton from 50,000 to 56,000 gallons of the 60,000 gallons required without any additional expenditure; and there would be no difficulty in laying a main from the present reservoir to supply all that Northallerton and Romanby needed. The clause which had been accepted by the North-Eastern Railway Company was not satisfactory to the Thirsk Company, as it would leave them in the position of having to keep a main doing nothing in order to supply the North-Eastern Company in case of the default of the Northallerton Local Board.

Monday, March 2.

Mr. *G. Anderson*, Secretary and Manager of the Thirsk Water Company, examined by Mr. BAGGALLAY, said the Company were prepared to supply water to the Local Board at a price and on terms which they were willing should be left to an officer or inspector appointed by the Local Government Board. At the present time the Company had something like 80,000 gallons of water per day to spare beyond the 40,000 gallons they were now supplying within the Northallerton and Romanby districts.

In cross-examination by Mr. LITTLER, witness said the number of consumers, exclusive of the North-Eastern Railway Company, was 116. The population of Thirsk was about 4500, and that of the area supplied by his Company about 6000. From Thirsk itself the income of the Company was about £600 a year. The number of consumers who were shareholders was about a dozen.

Mr. BAGGALLAY then addressed the Committee on behalf of the Water Company. Having called attention to their legal position, he admitted that they were supplying Romanby outside the limits of their Act; but it was not, he said, the Local Authority of that town who were coming to stop them. The Northallerton district were just as much volunteers for supplying Romanby as were the Thirsk Company; and there was nothing in their Bill to compel them to supply a single gallon of water to Romanby. As to Brompton, he was not concerned, for that was on the other side of the town. He submitted that if the Bill were allowed to proceed, their existing supplies to Romanby should be protected and allowed to be continued.

Mr. LITTLER stated that the mill-owners had been informed that the Local Board were prepared to supply them with 90,000 gallons of compensation water per day instead of the 60,000 gallons originally proposed.

Mr. BALFOUR BROWNE said this was the first he had heard of it. The promoters proposed to interfere in the most serious way with the rights, the property, and the water of the streams in which the mill-owners were interested; and it was their bounden duty to convince their Lordships, first, that they were not going to do the mill-owners an injustice, and also that they could not get the water they required by going elsewhere.

Mr. *W. Bowden*, a mill-owner, complained that, under the scheme of the Local Board, the whole of the spring water would be taken; and the remainder was only surface and flood water. With this he did not think his mill would be worked; and the action of the Board he regarded as very injurious. He did not consider the proposed compensation reservoir at all adequate; and thought it should be much larger. His opinion was that the mill-owners ought to be allowed monetary compensation under the general law; and this view was taken by the other mill-owners on the stream.

Mr. *A. Giles*, M.P., Vice-President of the Institution of Civil Engineers, said he had surveyed the valleys of the Oakdale Beck, the Jenny

Brewster Spring, and other streams in the neighbourhood, in January of the present year, and gauged the waters there. The promoters had themselves practically admitted the necessity of securing storeage for 120 days; and he was of opinion that at least this number of days' storeage should be provided for, which would mean a reservoir capable of containing 24 million gallons. Engineers differed as to the number of days that should be provided for; but he thought 120 days should be the least.

This concluded the case of the mill-owners.

Mr. LITTLER having replied on behalf of the promoters,

The room was cleared. On the re-admission of the parties,

The CHAIRMAN said the Committee had carefully considered the arguments, and had come to the conclusion that the preamble of the Bill should be passed; but they were of opinion that certain alterations in the clauses were necessary. Among these, they thought the Oakdale reservoir should be raised, so as to increase the capacity of the reservoir to 15 million gallons. They were not quite certain as to what was said with regard to the quantity of compensation water; but they understood that the 355,000 gallons would be struck out, and that the amount would be 1,000,000 gallons.

Mr. LITTLER said that the offer was made under a misapprehension, for which he was very sorry; but, as a matter of fact, 1,000,000 gallons did not now come down the stream.

Mr. COWARD maintained the contrary, and said that had it not been for Mr. Littler's offer, he would have proved it in evidence. He asked that the promoters should be held to their offer.

The CHAIRMAN said, if a mistake had been made, an opportunity should be given to correct it. It was of no use saying in the clause that 1,000,000 gallons should go down the stream, if it could not go down. The Committee must do what was reasonable.

After further discussion, it was arranged that the average daily flow over three years should be ascertained by measurement, and that the promoters should send down this quantity.

The other clauses were then settled.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Tuesday, March 10.

(*Before Lords Justices* LINDLEY, BOWEN, *and* KAY.)

Corporation of Wolverhampton v. Bilston Commissioners and Local Board of Health.

This was an appeal by the defendants against a decision given by Mr. Justice North in December last (see JOURNAL for Dec. 23, p. 1296) in an action brought by the plaintiffs to restrain the Commissioners from taking steps to supply their district, which was in the old parish of Wolverhampton, with water from any other source than the Corporation, in breach of an agreement, dated May 16, 1866, and subsequently modified by statute; or, in the alternative, it was asked that it might be declared that the plaintiffs were a "water company" within the meaning of the Public Health Act, 1875, and that the defendants might be restrained from commencing to construct waterworks within the limits of supply of the plaintiffs, so long as the plaintiffs were able and willing to supply water proper and sufficient for all reasonable purposes for which it was required by the defendants, in accordance with the provisions of section 52 of the Public Health Act, 1875. The facts which led up to the execution of the agreement have been already stated in the JOURNAL; but it will be well to recapitulate them. By an Act of 1850 the defendants were incorporated and constituted the Local Board of Health for the township of Bilston. Section 19 empowered them to construct certain water-works; but the compulsory powers of taking land for the purpose had been allowed to expire, and the works had not been made. Section 27, however, gave them authority to contract with other companies or persons for the supply of water. The Wolverhampton New Water-Works Company (whose undertaking is now vested in the plaintiffs) at the time of the agreement had power to supply Bilston. There was the South Staffordshire Water-Works Company from whom the defendants might purchase water. In 1858 and 1861 the Wolverhampton Company contracted with the South Staffordshire Company that the latter should not supply Bilston without the consent of the former. Practically there was no company except these two from which Bilston at the time could purchase water. Having made these engagements with the South Staffordshire Company, the Wolverhampton Company proceeded to enter into the agreement with the defendants. It was thereby mutually agreed between the parties that the Company should supply Bilston with water; and the Commissioners agreed to purchase "such supply," on the terms thereinafter set forth, for a period of 14 years. The Company were to supply to the township daily 220,000 gallons of water at the least, and such further and greater quantity as the Commissioners might "take, use, or require." The Commissioners were to pay for a daily supply of 220,000 gallons at the rate of 5d. per 1000 gallons, whether or not they used and consumed this quantity; and the Company were to supply at the same price any quantity which the Commissioners might require beyond. It was further agreed that the Company should not supply water to any other person than the Commissioners, nor to any premises within the township, during the continuance of the agreement, without the consent of the Commissioners. The agreement was confirmed by statute soon after it was entered into; and it was afterwards made perpetual. By another Act the powers and obligations of the Company were transferred to the Corporation of Wolverhampton; and, by various enactments, provisions were made for the application of the profits of the water undertaking for the benefit of the borough and the consumers. By arrangement, the question of the construction of the agreement and some questions of law were argued before Mr. Justice North before the evidence was taken. The principal questions were: Whether, upon the true construction of the agreement, the defendants were bound to take their supply of water exclusively from the plaintiffs, as the successors of the Company; and whether, if they were so bound, they were nevertheless empowered, by section 31 of the Public Health Act, 1875, to obtain a supply of water elsewhere, notwithstanding the provisions of section 52, which prevents a local authority from doing so if there is a company having power to supply water within their district. It was contended by the defendants that the plaintiffs were not a "water company" within the meaning of that expression as defined in the Public Health Act—*i.e.*, "any firm or body of persons, corporate or unincorporate, supplying, or who may hereafter supply, water for his or their own profit." Mr. Justice North held, upon the construction of the agreement, that the several words, "use," "require," "take," and "consume," which were employed in the document in relation to the water to be supplied, all meant the same thing, and referred to the quantity of water needed throughout the defendants' district, and that the defendants had contracted to take all their supply from the plaintiffs. His Lordship was also of opinion that, whether apart from section 52 of the Public Health Act, the defendants would or would not have been empowered, notwithstanding the agreement, to obtain water from another source, the plaintiffs were, within the meaning of the definition in the Public Health Act, "a corporate body supplying water for their own profit;" and therefore the defendants were prohibited by section 52 from acting under section 51, so long as the plaintiffs were able and willing to supply them. This decision having been given, the further hearing of the case was adjourned, in order that the defendants might have an opportunity of appealing.

Mr. F. MOULTON, Q.C., and Mr. UPJOHN appeared for the Commissioners; Mr. COZENS-HARDY, Q.C., Mr. A. UNDERHILL, and Mr. E. MOON represented the Corporation.

Mr. MOULTON argued the case for the appellants, and submitted that, according to the true construction of the agreement, the Commissioners must take from the Corporation a minimum supply of 220,000 gallons of water, but that for any quantity beyond this they were free to go elsewhere. The contention of the plaintiffs was that the Commissioners were under an absolute obligation in perpetuity never to get any water except from the Corporation of Wolverhampton, and at the price fixed by the contract. Bilston wished to supply itself with water; and it found that it could obtain all it wanted at a much lower rate than 5d. per 1000 gallons. If it could not get water for less than this, it was impossible that it could be used for trade purposes; and another point which he desired to submit on the construction of the agreement was that the supply was only intended to refer to water for domestic purposes.

Mr. UPJOHN followed on the same side, and continued his argument till the rising of the Court.

Wednesday, March 11.

Mr. UPJOHN, in further support of the appeal, submitted that it was the minimum clause about which the parties were bargaining, and that the true view of the contract was that the Company agreed to supply, and the Commissioners to purchase, water on the terms that the Company should send in 220,000 gallons a day, and should be bound to provide a larger quantity at the same price of 5d. per 1000 gallons if the Commissioners required it, but that there was nothing to prevent the latter body from obtaining the additional quantity from another source.

Mr. COZENS-HARDY then opened the respondents' case, and, as showing the interpretation that the Commissioners themselves placed upon the agreement in 1867, stated that in their petition against the Bill, under the authority of which the transfer of the water-works to the Corporation took place, they represented that, if the Bill became law, its effect would be to give the Corporation a monopoly of the supply of water to Bilston. He submitted that the agreement was for the exclusive supply, in consideration of which the Company gave up the right to sell water to individuals in the township; and that it would be most unreasonable for the Commissioners to be in a position to call upon the Corporation to supply 400,000 gallons a day during one week, and to refuse on the following week to take more than the minimum. Bilston could not supply itself with water without an Act of Parliament.

Mr. UPJOHN having been heard in reply,

Their Lordships reserved judgment.

Friday, March 13.

Judgment was delivered to-day,

Lord Justice LINDLEY said there was an agreement for the supply of water by the Bilston Water Company, and there was an agreement by the Commissioners to purchase such supply. The question was whether this did or did not impose upon the Company the obligation of supplying the entire township; and on the Commissioners that of purchasing such supply. Upon the whole agreement, the true construction was to impose such an obligation. He considered that the Commissioners were bound to purchase from the Company all the water required for the township; and he was fortified in his view by the clause by which they undertook to supply no one else. Then the question arose whether the plaintiffs and defendants were entitled to supply water to the township under the Public Health Act, 1875; and it was said that, by section 65 of that Act, the only power was to supply water for trading or manufacturing purposes. But this section was an enabling section, and to construe it as limiting the power of the Local Authority, would be to defeat its object. He considered that the appellants had failed.

Lord Justice BOWEN concurred; observing that the agreement ought to be read by the light of surrounding circumstances. If some new means of supplying Bilston with water should be discovered, then, if the appellants' view prevailed, the Company would be in this difficulty—that they would have expended large sums of money in constructing works destined for the supply of water for the township, only to find themselves left out in the cold at the eleventh hour. The negative condition that the Commissioners should not get their water from other sources, was implied from the language of the agreement. Having regard to the clause prohibiting the Company from supplying water to Bilston without the consent of the Commissioners, it would be most unjust to allow the latter to introduce fresh rivals.

Lord Justice KAY differed. After stating the facts and minutely examining the provisions of the agreement, his Lordship continued: The natural interpretation of this agreement seems to me to be that it gave no exclusive right to supply to the Wolverhampton Company. Not only is there an absence of express words to this effect, but the provision for the minimum supply of 220,000 gallons a day appears to me to be inconsistent with such a construction. If the intention was that the Company were to have the exclusive right of supplying Bilston, this provision for a minimum supply would be totally unnecessary. It is inconceivable that 220,000 gallons a day was more than was required at the date of the agreement; and, in fact, it appears from their own reports that the plaintiffs never have supplied less than this quantity since the date of this agreement. Bilston is a large township in a manufacturing district, in communication by railway with two of the great railway systems; and there was no probability of its ever requiring a smaller supply of water. Therefore the only advantage or object of this provision seems to me to be to compel the Commissioners to pay for the quantity specified in case they did not actually take it by reason of their obtaining water from other sources. They still have the right to make water-works of their own, if they can obtain the necessary land without compulsory powers. They still have power to buy water from other companies or persons, unless the contract prevents them. Circumstances may arise which may make it the duty of the Commissioners, having regard to the interests of the ratepayers of Bilston, to obtain some of their water, if possible, on cheaper terms. I am extremely loth to hold that they are prevented from doing this by anything contained in this agreement. I think such a construction ought not to be adopted without explicit words or an irresistible inference. After referring to the Act of Parliament making the contract in question perpetual, his Lordship continued: Possible cases were put in which this construction would occasion inconvenience to the plaintiffs; as, for instance, a sudden acquisition by the defendants of another supply. But this could only affect the quantity beyond 220,000 gallons, which the tables show has never been much more than an additional 100,000 gallons per day. Moreover, the sudden acquisition of an additional supply is practically impossible. The plaintiffs would have ample notice of any contemplated change. The truth is, it is only a question of the terms on which the supply is to be continued. It appears to me expedient that the defendants should have the means of compelling the plaintiffs to give them better terms if additional facilities of supply should make the present terms seem excessive. To deny this would, in my opinion, be a great hardship to the defendants; and if there is any ambiguity, this should be considered on their side. It is argued that this construction makes the agreement one-sided. I do not see that. The Company give up their right to supply except through the Commissioners, and also agree to provide all that the Commissioners require them to supply. But, on the other hand, they get an absolute rate of payment for 220,000 gallons daily, whether the Commissioners take it or not—a very considerable advantage, which it seems unreasonable that they should have if the Commissioners were prevented by the agreement from obtaining water elsewhere. Then again, I cannot see any adequate consideration for binding the Commissioners not to obtain water elsewhere. Another point raised was that the plaintiffs and defendants were not empowered to supply water for trade purposes under the agreement. I do not agree with this. Section 27 of the Act of 1850 enables the defendants to buy from any one water, without limitation as to the purpose. The agreement rested upon section 77 of the Public Health Act of 1848, which is identical with section 65 of the Act of 1875. That section enables a public authority to make agreements to supply water for trading purposes from water-works "purchased or constructed by them," and does not expressly say that they may make such supply out of water taken by them from other companies. But this is an enabling section, and is not intended to limit the powers of a public body to deal with the water which belongs to it, whether such water comes from their own water-works or is purchased from other companies.

The majority of the Court being against the appeal, it was dismissed.

The Plymouth Intimidation Case.—The London Trades Council have taken steps to appeal against the decision of the Recorder of Plymouth in the case of Curran and others convicted of intimidation (see *ante*, p. 114). We believe that an effort is to be made to secure the services of Sir Henry James, Q.C., M.P., when the case comes on for hearing in the Queen's Bench Division.

Tarapaca Water-Works Company, Limited.—A circular issued by the Tarapacá Water-Works Company, Limited, states that owing to the political disturbances in Chili, the final accounts for the past year will not reach England before the end of the present month. The annual meeting cannot, therefore, be held until June. The cable advices and remittances received enable the Directors to pay a further dividend of 5 per cent. out of the profits of the year.

Proposed Electric Lighting Scheme for Hampstead.—The Electric Lighting Committee of the Hampstead Vestry recently presented a report on the subject of carrying out a lighting scheme in the district. They consulted Mr. W. H. Preece on the matter, and he estimated the cost of an installation for street illumination and private purposes at £81,000. He recommended the Vestry to undertake the work themselves, and have a scheme for the whole parish, rather than for portions only. He put the working charges for a year as £15,800, yielding a revenue of £19,500; and after deducting £1400 as the increased cost of public lighting over gas, the net result would be a profit of £2300, while the total required to repay the loan and interest in 30 years would be £3455. His figures were based on the supposition that the Vestry would charge 6d. per Board of Trade unit, and that 24,000 16-candle power lamps would be rented by the ratepayers. In the absence of the Chairman of the Committee, a communication from him was read, as also another, offering special terms, from the Tottenham Company; and the Vestry finally decided to receive the report, but to postpone any decision for a month. A proposal that a poll of the ratepayers should be taken was rejected.

MISCELLANEOUS NEWS.

COMMERCIAL GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Friday, at the Cannon Street Hotel, E.C.—Mr. J. BLACKETT GILL in the chair.

The SECRETARY (Mr. H. D. Ellis) read the notice convening the meeting; and it was agreed to take as read the Directors' report and the accounts, the principal portions of which were given in the JOURNAL last week.

The CHAIRMAN, in proposing the adoption of the report and accounts, observed that, although nothing of special importance had occurred since he last addressed the shareholders, the results which were embodied in the accounts submitted to them on the present occasion had not been achieved without a considerable amount of trouble and anxiety. He was glad to report that amicable relations had subsisted between their workpeople and themselves, although at times—notably, at Christmas, when they wanted the men, perhaps, to give "an extra turn to the wheel," they did not manifest quite that activity which could be desired, though, possibly, this might be attributed to the teaching of unionism, which had as its creed that two men must be kept to do the work which used to be done by one. He thought it must be matter of congratulation to them all—especially to large employers of labour, like their Company—that the Government had appointed a Royal Commission with one at its head whose name commanded universal respect; and he sincerely trusted that some good might arise from it. As an outsider, it appeared to him that, until they had a large Government-aided scheme of emigration, there was not much hope. The proprietors might have noticed an account in the papers about the *Eastern Star*. This ship came to them laden with coal, and was to discharge her cargo at the Regent's Canal. Upon her arriving there, the whippers—to whom he referred at their last meeting as earning 15*s.* a day—unanimously declined to touch the ship. She was owned by the Federation of Shipowners, and was worked entirely by "free-men." The Company sadly wanted the coal; and the glaring anomaly was that, while these men declined to touch the vessel, their brethren were parading the streets demanding the rights of labour, municipal workshops, &c. At Christmas they had an especially severe winter; it was called "an old-fashioned winter." Although he was very conservative in his instincts, he was not fond of "old-fashioned winters;" and it gave the Company a great amount of trouble. They had to strain every nerve to keep their district supplied with gas. At one time the London County Council came down upon them, and endeavoured to inflict forfeitures for deficiency in the illuminating power of the gas; and, as would be noticed by the report, the Council succeeded in one case. He was not saying for a single moment that the Council had not full power to do what they did, as they were simply acting according to law; but he thought that, while it was agreeable to have a giant's strength, it was somewhat tyrannous to exercise it. He thought there was no institution which conferred such advantages on London generally that was subjected to such troublesome restrictions as the Gas Companies. The question of illuminating power was one which always gave them the greatest amount of trouble, for the reason that some of the experts themselves did not know the exact way of arriving at the standard of 16-candle gas. They were very often in hot water; and the amount of trouble that was occasioned, and the correspondence that took place, could not be imagined, except by those who were behind the scenes. Turning to the accounts, he observed that they possessed features somewhat different from those which the shareholders had been accustomed to for some years. This, of course, arose from the great advance in the price of coal. The increase in the amount expended for coal was £18,300 in comparison with the sum paid in the corresponding period of the previous year. This, coupled with the large rise in the price of labour—which the Directors had been prepared for—made a total increase of £24,500 in the cost of manufacture. This was a somewhat serious item, and was not to be regarded lightly. He found that the bad debts were less by £93, which he thought was a satisfactory feature. On the other side of the revenue account they had some crumbs of comfort, as he found that the sale of gas had produced £5640 more than in the corresponding half of 1889. This, no doubt, was welcome news, as it represented an increase of nearly 5 per cent. The meter-rent had also increased by 5 per cent.; and the gas-stoves, the number of which was now 3300, showed an augmented rental of £104. He had before dwelt on this matter with pleasure, because, while they were deriving great benefit themselves from the use of the gas in the middle of the day, they were at the same time, he was sure, conferring a great boon on the community. Now that they were constantly reading in the newspapers about objections to London fogs, the best thing that people could do to avoid the inconvenience was to use gas-stoves. (Laughter.) They had received an increase from coke—which had come in splendidly to their rescue—of £11,300; from tar they had realized about £600 more; but sulphate of ammonia showed a decrease of £1150. The result was that the additional receipts amounted to £16,500, to go against the £24,500 which they had had to pay for the increased cost of manufacture and of labour. The consequence was that, if the proprietors wanted the same dividend as they received last half year, they must resort to their undivided profits; for they were about £8000 short of the amount required. He believed they would agree with him that it was far wiser, and that it was their duty in these circumstances, to take this amount from the undivided profits they had, than raise the price of gas. He was quite certain—and he felt sure that the proprietors would agree with him—that it was their bounden duty, and it was likewise for their ultimate well-being, to keep the price of gas as low as they possibly could, and to make it as popular as possible. They therefore did not propose at present to raise the price; and, with the proprietors' sanction, they would take £8000 from the undivided profits, in order to declare the usual dividend. It used to be said in olden times that the great prosperity of gas companies would be their ultimate ruin—that it excited the cupidity of a section of the community who were very fond of enriching themselves at the cost of their neighbours. If such were the case, the present slight wave of adversity would be to the Company's

ultimate benefit. It would stimulate economy, and induce them to look out for any other means there might be of which they could profitably avail themselves. The Company was, without doubt, fixed upon a very secure and firm foundation; and he thought that the whole statement with regard to the six months' working was extremely satisfactory, considering what they had gone through, and remembering the increased cost of coal and labour. He hoped and believed that prosperity was still in store for them—perhaps not so great as they had enjoyed in the past, yet very satisfactory for years to come. The question of the issue of new stock he would refer to after the disposal of the resolution now before the meeting.

The DEPUTY-CHAIRMAN (Mr. Robert Jones) seconded the motion.

Mr. ENNIS said he quite agreed with the Chairman that it was inexpedient at present to raise the price of gas. At the same time he was sure that the Directors would not forget that the strength of a gas company lay in the preservation of its reserve fund. It was lamentable to see a reserve fund disappearing; and though he did not say that this was their case, yet there was an instance where this was going on. He hoped that the Directors would not be deterred by any sentimental consideration from raising the price of gas, should it be required in order that the reserve fund might be kept intact. With regard to the question of issuing new capital, they were a long way ahead of the necessity of having to go to Parliament for any new powers; but should it be requisite, he hoped the Directors would remember the action of the Bristol United Company, which had carried out what he himself had strongly recommended to Mr. Thomas Livesey. The Bristol Company had carried out a scheme which would remove from the public mind the notion that shareholders in gas companies were having dividends of 10 per cent. and more. As a matter of fact, there were very few shareholders who were now receiving 10 per cent.; the vast majority of investors in gas companies getting only 4 or 5 per cent. By adopting the same scheme as the Bristol Gas Company had done, they would get rid of the odium attached to gas companies on this account; and the premium obtained would be consolidated into an actual parliamentary stock.

The motion was carried unanimously; and the dividends recommended were afterwards approved—of 13¾ per cent. per annum upon the old stock, and 10¾ per cent. on the new stock, less income-tax.

The SECRETARY then read the following resolution relating to the proposed issue of further capital: "That the Board of Directors be and are hereby authorized, in exercise of the powers conferred by the Commercial Gas Act of 1875, to raise the sum of £70,000 by the issue of new ordinary stock to the amount of £35,000, such stock to be denominated new stock, and by the issue of debenture stock to the amount of £35,000, such debenture stock to bear interest at the rate of 4½ per cent. per annum; and that such new stock and debenture stock shall be offered at par among the respective proprietors of ordinary new and preference stocks in rateable proportion to the amount of stock appearing by the register of the Company to be held by such proprietors respectively at the dates of such offers, but so that no offer or apportionment of such new stock or debenture stock shall be any fraction of one pound sterling. That if any proprietor fail within the time limited by the Board of Directors to signify in writing his acceptance of such new stock or debenture stock, or shall make default in paying the amount payable in respect thereof on or before the time fixed by the Board of Directors for such payment, the proprietor so making default shall be deemed to have declined to accept the stock offered to him; and that any stock not accepted by the proprietors may be disposed of by the Directors at their discretion for the benefit of the Company; provided that the Directors may, on such grounds as they may deem sufficient, extend the time for the acceptance of any stock or the payment of the amount payable thereon, on such terms as the Board may deem proper."

The CHAIRMAN said that this was the resolution which he had now to propose for their adoption. In 1875 they obtained their Act for amalgamating with the Ratcliff Gas Company and for raising fresh capital. In mentioning this matter, he could not help remembering that the Company owed a great amount of gratitude to their then admirable Chairman (Mr. Bradshaw) for fighting their battle in a very successful manner. It was somewhat saddening to reflect that nearly all the Directors who were at that time Mr. Bradshaw's colleagues had fallen from the ranks; and they were, in fact, only cheered by the presence of one of the directorate at that time. He referred to their Deputy-Chairman. No doubt, they obtained greater advantages than their neighbours. They accepted the sliding scale with an initial price of 3s. 9d.; and Parliament gave them power to raise their capital at par among the proprietors. Probably they might have noticed in the papers the other day that Mr. George Livesey had dwelt in rather glowing terms on the advantages possessed by the South Metropolitan Company in having the auction clauses. He thought that, as far as the Commercial Company were concerned, they might smile too, because they had the advantage of putting the premium in their own pockets. He was, however, bound to confess, as an official of the Company, that he would not object to the premiums they obtained going to the benefit of their capital account; but, of course, this would not be fair to those who had invested in the Company on the faith of the conditions referred to. At the time to which he had alluded, they were sailing along in the full tide of prosperity; and there was no doubt about their being able to pay the dividend on the capital which was at that date paid up. At the present time, however, when they had to draw £8000 from their undivided profits to pay the dividends now declared, the proprietors would see that great prudence must be exercised; and they must not call up a farthing more than they felt compelled to do. They did not, however, propose to call up the sum mentioned directly, because they hoped that in the course of a few months they would obtain their coal contracts on somewhat easier terms than they had had to pay of late. He ought also to tell them that, when they met next October, they would probably not come out quite so well as they did that day, as in the current half year they would feel the whole force of the higher coal contracts. The existing high prices did not really come upon them much before September last, and now they would be working from January to June. It would therefore be very unwise for them to raise more capital than they felt they were obliged to, and until they believed that their coal charges would be somewhat lighter. The proprietors would receive a month's notice of any call; but he did not think they would hear about the matter for a few months. Parliament had given them this privilege; and it had also arranged for them that they should allot a certain quantity of 7 per cent. stock, followed by the same quantity of debenture stock. If they allotted the £70,000 of 7 per cent. stock as they had done previously, it would make a very great demand on their resources, as they were paying to-day 10¾ per cent. upon it. What they proposed was to issue £35,000 of 7 per cent. stock, followed by £35,000 of debenture stock. This arrangement would relieve them of a charge, at the existing rate, of £2000 a year, which would, no doubt, be to their advantage. It might be a little unfortunate that they should feel compelled at the present time to come forward and ask for fresh capital; but as they had overdrawn their capital account by something exceeding £20,000, he thought the time had arrived when they must think about it. They trusted, however, as they had had a very fair and satisfactory increase in consumption during the past six months, and as there was every hope of their continuing to increase, that they would be able to meet all their charges in future if—it was an important "if"—they could get their coal at an easier rate; and the Company had such a substantial reserve fund that he did not think they need fear any difficulty.

The DEPUTY-CHAIRMAN seconded the motion, which was unanimously agreed to.

The retiring Directors (Messrs. H. L. Hammack, W. G. Bradshaw, and T. Bevan) were re-elected, as was also the retiring Auditor (Mr. A. G. Hounsham).

On the motion of Mr. COLEMAN, a cordial vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN acknowledged the compliment; and afterwards proposed a vote of thanks to the Engineer, Secretary, Accountant, and other officials; observing that Mr. Jones had been very much engaged lately in fighting their battle in connection with their rates. There had been a fresh assessment; and they had had to fight very strenuously in order to avoid having to pay a very large increase. He also testified to the value of the services rendered by the Secretary and the other officials.

The DEPUTY-CHAIRMAN seconded the motion, which was carried unanimously.

The ENGINEER (Mr. H. E. Jones), in acknowledging the compliment, observed that, after going through labour troubles in one year and coal troubles the next, he had not been quite prepared to find that they would have rating troubles in the third year. The proprietors would be amused to hear that, in the very year in which the Company had had their contracts for coal enormously increased in price, and in which they had had to pay 50 per cent. more for their labour, the wiseacres in their district had come upon them to raise the rates. With reference to the question of the *Eastern Star*, to which the Chairman had alluded, he had never felt more chagrined in his life than at the position which this matter assumed. It was not one with regard to which the Company was directly liable. The ship had to be unloaded by the contractors; but it was extremely galling to find that, on account of some dispute between totally different persons in a totally different part of the kingdom, they were not allowed peaceably to receive the coal which they had bought. He was, however, glad to say that all these questions were settling themselves. The position taken in this matter was exactly that which had been taken at Cardiff between the Shipping Federation and the London Docks—it was so unreasonable that it had to be abandoned. In fact, when abuses became too glaring, they inevitably cured themselves. His own feeling was one of confidence that they were not only drifting back to a healthier state of things, but that the pernicious doctrines which were being circulated among workmen a few months ago were no longer being disseminated. Directly anything became too costly for manual labour, the inevitable inventor stepped in, and enabled them to dispense with it. He would like to supplement what the Chairman had said as to their capital. The proprietors had the unique privilege now of having new stock allotted to them without competition by auction, and without paying any premium on it. At the same time, though they had enjoyed this privilege for fifteen years, so prudently had the power been wielded by those in authority over their undertaking, that they stood with their capital not swollen over that of their neighbours, but with a capital conspicuously small. Their capital represented a smaller unit on their output as compared not only with the other Metropolitan Companies, but with all the other large gas companies in the kingdom. The present dividend took less by 3d. per 1000 cubic feet of gas sold than what they sold twelve years ago, when the dividend was only 10 per cent.

The SECRETARY also returned thanks; and the proceedings then terminated.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Tuesday—Mr. E. FOTTRELL, J.P., in the chair.

The SECRETARY and MANAGER (Mr. W. F. Cotton) read the notice calling the meeting; and the Directors' report and the accounts (which were summarized in last week's issue) were taken as read.

The CHAIRMAN, said the balance-sheet compared very favourably with that of the corresponding period of the previous year. The profits on the past half-year's working amounted to £38,627, as against £31,211. This satisfactory result enabled the Board to recommend the payment of a dividend of 10¾ and 7½ per cent. on the respective shares, the same as that last paid; leaving a balance to be carried forward of £4770, whereas, in the corresponding period of last year, the dividend necessitated the withdrawal from the reserve fund of £3447. There had been added to the reserve fund a sum of £2394, which accrued by adding the interest on invested funds (£1200), and also £1194 realized by the change of the 4 per cent. Corporation debenture debt into the new 3¼ per cent. inscribed stock. The reserve fund now stood at the respectable sum of £59,377. During the half year they had carbonized 61,732 tons of coal, as against 60,811 tons. The cost of coal was in excess by about 1s. per ton; and this was caused by the increased price of cannel, and also by the extra wages

in the carbonizing department. The gas made was 625,425,000 cubic feet, as against 619,617,000 feet. The production per ton of coal was 10,131 feet, which compared favourably with other companies. The liberal and judicious expenditure on mains and services, to which he had alluded on previous occasions, was now showing good results; the "unaccounted-for" gas having been reduced to under 8 per cent. This was eminently satisfactory, considering the large area through which distribution was made, and would bear comparison with other companies where a larger quantity of gas was delivered in a more limited district. The wages at the works showed an increase consequent on the new system of eight-hour shifts. Since the alteration, there had been no complaints; and the workmen had discharged their duties with proper attention. The residual products exhibited a good increase. This was more applicable to coke, because as more coal was carbonized, more coke was made, and the enhanced price for coal enabled them to get an increased price for coke. As regarded tar and ammoniacal liquor, the trade had not been so brisk or remunerative. Sulphate of ammonia was at a considerably less price than formerly. Referring to the progress that was being made in the use of gas-stoves both for heating and cooking, he assured the shareholders that the Directors were using every exertion to extend the consumption of gas by this means. There was likewise an extension in the use of gas-engines; several having been put up during the half year. The shareholders would see in the report that a sum of £14,341 had been paid by the Corporation for the purchase of the street lamps. The award of this sum, under arbitration, was made some months since; but the amount not having been paid during the half year, it did not appear in the present accounts, but would be dealt with in the next. He concluded by moving the adoption of the report and accounts.

Alderman GILL seconded the motion.

Professor HULL said he thoroughly concurred with the Chairman in the view that this was a most satisfactory balance-sheet; and he congratulated the shareholders on the statement that had been laid before them. He was glad to say the increase in the revenue was not due solely to the advance in the price of gas; but very largely, perhaps mainly, to the greater amount of gas which had been consumed during the six months compared with the corresponding six months of the previous year. He was aware that there were shareholders who looked upon the installation of the electric light with apprehension, and were watching for an opportunity of parting with their shares. To those gentlemen he would say that he had been a shareholder a considerable number of years; and he did not recollect a year during that time that the Company had not been suffering from the panic of the possible introduction of electric light. He recollected in 1878 when the Edison panic took place, that the shares went down, he thought, to £13. [Dr. W. J. FITZPATRICK: 11½.] Possibly they were accustomed to that sort of thing; and if his brother shareholders would follow his advice, they would not part with their shares under the apprehension of any danger of depreciation on account of the introduction of the electric light on the part of the Corporation.

The motion was carried.

The CHAIRMAN moved that a dividend at the rate of 10½ per cent. per annum on the old shares, and 7½ per cent. per annum on the new shares, be declared.

Mr. PIM seconded the motion, which was carried.

The retiring Directors and Auditor having been re-elected, votes of thanks were passed to the Chairman and Directors and to Mr. Cotton and the staff.

This concluded the proceedings.

METROPOLIS GAS SUPPLY.

Recent Appeals to the Chief Gas Examiner.

(*Continued from p. 604.*)

In the matter of the appeal of THE GASLIGHT AND COKE COMPANY *against the report of the Gas Examiner at the Millbank Street testing-place, showing deficient illuminating power in the gas supplied by the Company on Oct. 9, 1890.*

The appeal was lodged within seven days after the day on which the report was made. At the hearing which I gave to the parties in this appeal, Mr. Trewby appeared for the Company; Mr. Dibdin appeared for the County Council.

The Company stated that their gas, as sent out from the works, showed an illuminating power of 21 candles, but when tested in a room in the same building with the official testing-place, its value agreed substantially with that shown by the official test; and they admitted that there was a deficiency in the illuminating power. They accounted for the defect in the gas by supposing that air must have got mixed with it to bring down its illuminating power to the point observed.

It appeared that on the 8th of October the Company had occasion to open the main in order to clear out a deposit of naphthalene which obstructed it at a point very near to the gasholder. Before opening the main, they closed up the passage through it at two points, one on each side of the obstructed part, and not many feet from the obstruction. While this short length of the main was being cleared out, the gas in it was allowed to escape, while air entered in place of the escaping gas. The Company have a simple and apparently very good process for driving out air from this short length of the main before again using the main for the conveyance of gas. It appeared, from the evidence of the Engineer at the works where this process took place, that the process was duly carried out on this occasion.

If all the air which entered the main during the process of clearing out had been left there to pass on to the gas in the holder, there would have been some 33 cubic feet of air to mix with the gas in a holder of 115,000 cubic feet capacity. It does not appear probable that more than a very small proportion of the 33 cubic feet of air can have been left in the main, or that such small quantity of air could have reduced the illuminating power of the gas in the holder from 21-candle power to 19·4-candle power. The report of the Gas Examiner must accordingly be accepted.

(Signed) ALEX. W. WILLIAMSON, Chief Gas Examiner.

March 3, 1891

In the matter of the appeals of the SOUTH METROPOLITAN GAS COMPANY *against the reports of excess of sulphur in the gas supplied by the Company at the Hill Street testing-place on Dec. 8, 9, and 10, 1890.*

Each of the appeals was lodged within seven days after the day on which the report was made. In the hearing which I gave to the parties in these appeals, Mr. F. Livesey appeared for the Company; Mr. Dibdin appeared for the County Council.

It was stated, on behalf of the Company, that the same evidence would be tendered in support of each of these appeals. The three appeals were accordingly taken together. It appeared that the Company employed washers containing a crude solution of ammonia for the removal of the carbonic acid and some of the sulphuretted hydrogen from the gas before it passed to the lime purifiers. The washers are so constructed that the gas in them can at pleasure be made to pass through a great number of small openings, and undergo the action of the ammonia solution, or merely pass through a few large openings without being so purified. The low temperature which prevailed for some time before, as well as at the time of the reported defect in the gas had caused the deposition of large quantities of naphthalene in the washers, and the obstruction of the small openings through which the gas passed while undergoing purification. It became necessary to allow the gas to pass through the large openings; thus escaping the usual purification. The effect of thus passing gas through the lime purifiers which had not undergone the usual preliminary purification was to throw upon these lime purifiers more work than they were capable of doing; and the gas passed out for use inadequately purified.

It can hardly be a matter of surprise that such a comparatively new apparatus should fail to work well during the exceptionally long and severe cold which prevailed last December; and means will doubtless be provided to prevent the recurrence of such a stoppage of its action.

It appears to me that in this particular case the accident which gave rise to the defect in the quality of the gas on the three days of the appeals was unavoidable.

(Signed) ALEX. W. WILLIAMSON, Chief Gas Examiner.

Jan. 5, 1891.

GAS AND ELECTRIC LIGHTING IN BOSTON (U.S.A.).

A short time ago, Mr. Malcolm S. Greenough, the Engineer of the Boston (U.S.A.) Gaslight Company, read an interesting paper before the Society of Gas Lighting, New York, on the position of the gas and electric undertakings in the city with which he has been so long associated. It appears that Boston was one of the pioneer towns in adopting gas; a Company having been started there in 1823—only six years after the first gas undertaking in America had been established at Baltimore. The experiment was a failure, and the Company became bankrupt and its works were sold up; whereupon the present North End station was started in 1827. By the year 1841, the output of gas, with the price at $5 per 1000 feet, was 17,461,000 cubic feet per annum; and the subsequent great growth will be apparent from the following figures: In 1850, with the price at $3·50, the consumption was 75,280,750 cubic feet, or an increase at the rate of 331 per cent.; in 1860, with the price reduced to $2·25, it was 271,000,000 cubic feet, an increase of 260 per cent.; in 1870, with a $3 price (a rise of 75c.), the quantity consumed was 520,725,000 cubic feet, or an advance of only 92 per cent.; in 1880, with a $2 price, it was 712,550,000 cubic feet, an increase of 48 per cent.; while last year with a reduction of 70c. in the charge, the consumption was 1,312,000,000 cubic feet, or a rise to the extent of 84 per cent. In Roxbury and South Boston the growth has been equally satisfactory. In 1860 the consumption of gas was 17,406,800 cubic feet in the former, and 10,762,845 cubic feet in the latter place; whereas last year it was 175,642,000 and 67,064,931 cubic feet respectively. This makes the present consumption of gas in Boston about 44,000 cubic feet for each meter fixed; or assuming the population of the district supplied to be 150,000, about 7500 cubic feet for each person. Mr. Greenough thought if Boston had practically doubled its output of gas in the past ten years in face of the development of electric lighting, it would be interesting to see what part electricity had played in this period. So far as arc lighting was concerned, he thought it was recognized as an assistance in the large cities, by having raised the standard of light. But what had been done by the incandescent system? To answer this question intelligently, he tried to ascertain how many electric lights were in use in Boston. He was told that the Boston Electric Light Company had 8000. He inquired the number of thousand feet of gas to which these were equivalent. The ampere meters of the electric companies showed the number of amperes sent out by them in 24 hours; and, estimating so many to a 16-candle power light, they could tell how much gas had been displaced. For 8000 lights he was told there was an equivalent of 113,500 cubic feet of gas, or about 14 feet to a burner. The Edison Company claimed to have about 40,000 lights in Boston, and about 30,000 in operation at the time of their heaviest load. If, then, 40,000 lights had 14 feet to a light on an average, it would give 560,000 cubic feet of gas, which added to 113,000 would make 673,000 cubic feet of gas as the amount sent out by the two Companies in Boston, or about one-tenth the quantity of gas supplied in the districts in which they have incandescent light. The capital invested in these Companies is much more than one-tenth of that invested in gas; and the price is about 50 per cent. more than that at which gas is sold. Mr. Greenough added that it scarcely seemed to him as though the development of electric light in the next five years was going to be so great as in the last five. There was a stratum in the consumers of gas—if he might use such an expression—who were going to displace it for electric light, if they had not already done so; but he thought this stratum was extremely limited in extent. He looked for a development of gas during the next ten years, not only for lighting but for other purposes, which would fully equal the last ten years.

Sale of Shares.—Thirty fully paid £5 shares in the Leyburn Gas Company were sold by auction, last Thursday week, at from £7 5s. to £7 12s. 6d. each.

PROPOSED EXTENSION OF THE ROCHDALE GAS-WORKS.

At the Meeting of the Rochdale Corporation last Thursday—the MAYOR (Mr. W. T. Heap) presiding—the Gas Committee presented a report in which they said that, being satisfied that the gas-works are now taxed to the full extent of their producing power to meet the demands of the town in the darkest months, and that the annual rate of increase in consumption is steadily and fully maintained, they had resolved to obtain plans at once for the needed extensions, and to apply to the Local Government Board for borrowing powers in order to carry out the work.

Alderman W. J. PETRIE explained that the Committee had seen for the last two or three years that it would be necessary to extend the producing capacity of the works, in order to meet the requirements of the town. They had not added anything to their capital account since the financial year ending March, 1878, when they borrowed £30,000, although additions had since been made. At that time the production of gas was 245 million cubic feet in the year. In the twelve months just closed it was 376 millions; or an increase in the 13 years of 53 per cent. It was evident that some extensions had been made; but these had been paid for out of revenue. The Committee had had their eyes open to the improvements and inventions which had taken place in the gas world, and had thought proper, from time to time, to test different kinds of retorts and settings. Thus while they had been experimenting and bringing their information up to date in gas matters, they had also been supplying the extra amount of production required up to the present time. Now, however, they had encroached as far as they could on their storeage space for gas, and could not put off any longer the proper extensions, which would be too important to be paid for out of revenue. Even if the Committee had a reserve fund big enough, they thought it would be unfair to pay for the extensions out of it. They thought they would be perfectly justified in asking posterity to bear a share of the burden. But there was no reserve left. However, the works were in a healthy condition, and the fund would at once begin to grow again; so that what the Committee recommended—viz., to seek power to borrow money for the proposed extensions—would, he thought, be the right thing to do. The estimates had, of course, to be gone into, and plans prepared; and therefore he would rather not commit himself to figures. The sum required would, however, be perhaps £60,000. It was intended to increase the works in all departments, and the extension would take place on the present site.

Mr. DUCKWORTH congratulated the Chairman of the Committee on the statement he had made, as it indicated distinct progress in the extension of the town, and a state of prosperity in the community for which they should be very thankful. He did, however, expect that in Alderman Petrie's explanatory remarks something would have been said as to the desirability of providing the town with the electric light. He understood they had prohibited any outside company from coming into the town, and this prevented persons from using electric light unless they provided plant of their own for the purpose. Did the Gas Committee think of providing in this extension for supplying electric light to those who preferred it to gas?

Alderman TAYLOR suggested that in the summer months gas should be sold for illuminating purposes at the same price as for cooking. He failed to see why any difference should be made.

Alderman PETRIE, in reply, said electric lighting had nothing to do with the works now proposed. There was little enough room for the gas-works; and when the electric lighting trade was undertaken, it would have to be conducted in a different part of the town. The Committee did not think the time had yet come for this. It was true that people had applied for sanction to erect electric lighting works in the town. To this the Corporation had objected, on the ground that when such works were required they intended to have them in their own hands. The last decision come to by the Committee was that when they thought the town wanted the electric light—they did not think it was required at present—they would take steps to provide it. As to the price of illuminating gas being reduced to the same rate as cooking gas—2s. per 1000 cubic feet—he said this would not be remunerative.

The minutes were passed.

LEICESTER CORPORATION GAS AND WATER SUPPLY.

Half-Yearly Accounts—Reduction of Gas-Meter Rents.

As briefly reported in last week's JOURNAL, at the Meeting of the Leicester Town Council on the previous Tuesday—the MAYOR (Mr. Alderman Kempson) presiding—the accounts of the Gas and Water Committees for the half year ending Dec. 31 were presented.

From the accounts of the Gas Committee, it appeared that the net profit, after paying interest on the capital of the undertaking, was £13,794. Out of this sum had been paid £2762, the half-year's amount of sinking fund, leaving a balance of £11,032, which, added to the net profit (£13,179) for the half year ending June 30, 1890, would make a total of £24,211 to be applied to the district fund at the close of the current financial year (March 25), or from which the Council might, if they were so minded, appropriate or set aside a sum to be applicable for the renewal of works under the authority of section 17 of the Leicester Corporation Act, 1884. The accounts included, and the statement set out, the result of the working of the residual products manufacture and the gas-fitting business. The net amount realized by the former was £8772. With regard to the gas-fitting business, the half-year's working showed a net profit of £415. The Committee recommended that a sum of £5000 be placed to the gas-works renewal fund, and that the remainder of the net balance, £19,211, be applied to the district fund in accordance with the provisions of the Local Act of 1878. During the half year 54,063 tons of coals had been carbonized. The quantity of gas made was 543,017,000 cubic feet, as against 494,579,000 cubic feet in the corresponding half of the previous year; being an increase of 48,438,000 cubic feet, or 9·79 per cent. The average illuminating power of the gas had been as follows: Belgrave Gate works, 17·24 candles; Aylestone Road works, 17·27 candles; and at the Town Offices (Millstone Lane), 16·68 candles. The Committee had pleasure in reporting that the manufacture of gas was commenced in the new section of the Aylestone Road works on Nov. 27 last, in time to enable the Committee to maintain an efficient supply of gas during the winter months. The whole of the new works were now in operation, and working in a most satisfactory manner. The Committee also reported that they had had under consideration the advisability of a further reduction in the scale of charges for rental of meters; and they were now pleased to recommend that from June 30 next, the scale of charge be as follows: For a 3-light meter, 6d. per quarter; 5-light, 9d.; 10-light, 1s. 6d.; 20-light, 2s.; 30-light, 2s. 6d.; 50-light, 4s.; 60-light, 5s.; 80-light, 6s.; 100-light, 7s.; and 150-light, 9s.

Mr. LENNARD, in moving the adoption of so much of the report as related to the financial statement, remarked that he was very glad to find that the decrease in the profits had not amounted to so much as he had anticipated. They had had an increase in the business for the half year of 10 per cent.; but, that fact notwithstanding, they had about 30 per cent. less profit as compared with the previous year. He hoped, however, the Council would consider that the result was satisfactory, because he could assure them that they were lucky in not having to raise the price of gas. Many neighbouring towns had had to increase the price; and, under all the circumstances, he hoped the ratepayers and gas consumers of Leicester would be perfectly satisfied with the balance-sheet the Committee were now able to present.

Mr. BILLINGS seconded the motion.

Alderman WOOD expressed the opinion that the Committee had probably passed through their worst year, as they were looking forward now to a reduction in the price of coal. They had heard a good deal said to the effect that the profits on the Gas and Water Departments were likely to seriously diminish; but he considered they had already reached something like a minimum profit. They were told that the profit of the Gas Department had been £30,000, but was now coming down to something like £12,000. The profit had been £30,000 several times; and whenever it had been, the Corporation had taken care to reduce the price of gas. If the present price of gas was the same as in 1881, the profit of the department would stand at about £20,000; but the policy of the Council had always been to give the consumers an advantage corresponding with the amount of profit made. He held that the profits were not likely to diminish beyond the sum presented to them that day.

Mr. LENNARD said he could not quite bear out what Alderman Wood had said. His remarks as to what the price of coal would be were, of course, only an expression of his own individual opinion. That would depend a good deal upon the eight-hours question. If it did not come into vogue, he thought they had perhaps reached the very bottom with regard to their profits. But he could assure them that, the greater the increase there was in the consumption of gas, the less would be the charge for production per 1000 cubic feet, because their new works, which they were gradually using more largely, were built at such a low rate as compared with what had been their previous experience, that if the price of coal, and also the price of gas, remained what it was at present, their profits would go up very much indeed.

The motion was carried.

Mr. LENNARD next moved the adoption of so much of the report as referred to the renewal and district funds.

Mr. BILLINGS seconded the motion, which was carried.

Mr. LENNARD then proposed the adoption of the recommendations of the Committee relating to gas-meter rents. He said that the amount which it was now proposed to charge for the meters would leave the Council no margin whatever, but would simply cover the charge for fixing, removing, cleaning, and so forth, and leave them merely 3½ per cent. on the actual cost of the meters.

Dr. BREMNER seconded the motion, which was carried.

Mr. LENNARD proposed the adoption of the remainder of the report, and that the proceedings of the Committee generally be confirmed.

Mr. INSKIP said he hoped the Committee would take an early opportunity of bringing forward a report whereby the consumers of gas would reap a greater and more direct benefit from the large profits which were being made by the department—viz., by a reduction being made in the price of gas.

Mr. LENNARD remarked, with regard to Mr. Inskip's suggestion, that the price of gas had been reduced from 2s. 10d. to 2s. 4d.; and, as soon as the finances of the borough admitted of it, there was every likelihood, provided, of course, that the prosperity of the department continued, that a further reduction of 2d. would be made. He (Mr. Lennard) contended that the money that had been earned by the skilful management of the works had gone in reducing the price of gas to the consumer, and in generally improving the town.

The report was then adopted.

The Water Committee reported that the accounts of their undertaking for the half year showed that the net profit, after paying interest on the capital of the undertaking, was £7620. Out of this had been paid £1973, the half-year's amount of sinking fund, leaving a balance of £5647, which, added to the balance of net profit (£5272) for the half year ending June 30 last, would make a total of £10,919 to be dealt with by the Council at the close of the current financial year. The Committee recommended that the same be applied for the benefit of the district fund. The quantity of water delivered during the year 1890, within the limits of supply, had been 1,232,643,410 gallons; and the average consumption of water per day per head of the population supplied had been 18·53 gallons. This also included the quantity supplied for trade purposes. The number of houses on the books in December was 37,124, giving an estimated population of 185,620, which was an increase at the rate of 3·10 per cent. per annum.

Alderman WOOD, in moving the adoption of the report, mentioned that but for three payments of a special character, the net profits would have shown an increase of £1750 on the year. In the course of the next ten years, the Corporation would be compelled to spend £270,000 on new water-works. Their profits were growing at the rate of £2000 a year; and they did not believe the net profit handed over to the Corporation would be affected while those works were in course of construction.

Mr. COLEMAN seconded the motion, which was carried.

GAS AND GAS-METER TESTING IN MASSACHUSETTS.

We have received from Mr. C. W. Hinman, the Inspector of Gas and Gas-Meters for the State of Massachusetts, a copy of his annual report to the Legislature on the work of his department. The following extracts from the document embrace the portions which are likely to be of most interest to our readers:—

Dealing first with the subject of meters, the report states that during the year ending Dec. 31 last, 18,205 were inspected. This was a much larger number than had been tested in any previous year; and the increase was due in a large measure to the action of the Boston Gas-light Company in repairing a considerable proportion of their meters. The number of new or recently repaired meters inspected was 17,984; and 221 which had been in use for some time, and were suspected of being incorrect, were submitted for re-examination. Of the latter number, 64 were found to be too fast—their average error being 5·32 per cent.; 134 were found to work within the legal limit of 2 per cent. either way; 20 were too slow (the average being 23·60 per cent.); and 3 did not register at all. The average error of the 218 registering meters was 0·60 per cent. too slow. All the meters at present in use in the State are of the dry class. It will be of interest to compare the foregoing figures with those for 1889. In that year 13,592 meters were inspected, of which number 13,412 were either new or recently-repaired instruments. There were 180 suspected meters sent in for re-inspection. Of these 42 were too fast—the average error being 5·65 per cent.; 121 were within the legal limits; 16 were too slow, with an average error of 15·41 per cent.; and 1 did not register at all. The average error of the meters that registered was 0·05 per cent. too slow. Of late years, about 60 per cent. of all the suspected meters taken to the Inspector's office to be re-tested are found to be correct. Of the 40 per cent. of incorrect meters, 70 per cent. are fast and 30 per cent. are slow; but the latter are, on an average, more than twice as much in error as the fast meters. Occasionally a travelling meter inspector visits some of the cities in the State. On reaching Boston, his first business is to submit his meter for inspection. If it works correctly, an official certificate is given to this effect. He then proceeds to test any size of meter by connecting it with his own, and passing gas through both. Mr. Hinman acknowledges that this style of testing meters, even if carefully performed, can only give an approximate idea as to the real condition of the instruments. The fee charged to the consumer for this inspection is usually at least twice as much as he would have to pay, if he had to pay anything at all, for an official inspection. The test would seem to do the consumer very little good, as no gas company, in case of a dispute, ever trusts so imperfect a test, but sends the meter to the State Inspector. Careless work in disconnecting and connecting frequently produces leaks and injuries to meters and fittings. In view of these facts, Mr. Hinman considers it would be well to pass a law prohibiting unauthorized persons meddling with meters in any way.

Coming now to the testing of gas, the report states that the gas of the 69 companies in the State was examined in like manner. The tests of the gas of the larger undertakings were always made at some distance from the works, and generally at the companies' offices; that of the smaller companies was tested at hotels and town halls, as well as at the offices. The inspections were made at rather irregular intervals; and, of course, no notice was ever given when they were to occur. More inspections were made in the autumn, winter, and spring than in the summer months, so as to follow the production of gas to a certain extent. The average illuminating power of the gas supplied by the smaller companies was found to be 17·67 candles; the sulphur averaging 10·19 grains, and the ammonia 2·67 grains per 100 cubic feet. For the larger companies the averages were as follows: Illuminating power, 17·98 candles; sulphur, 9·97 grains; ammonia, 3·51 grains. Comparing these results with those of the previous year, there is found to be a slight increase in the illuminating power of the gas supplied by the larger companies. Some of these manufacture a mixture of coal gas and water gas; the former usually being the larger proportion of the entire bulk. They generally show an increase as compared with the previous year; but there were great fluctuations in the light-giving value of the gas—the average difference between the highest and the lowest power being a little more than 3½ candles. The remainder of the larger companies manufacture coal gas, which is ordinarily somewhat enriched with oil gas. These show a small decrease in the illuminating power as compared with last year—the average being nearly one-third of a candle. On the other hand, these companies, on the whole, show much smaller fluctuations than those supplying a mixed gas; the average difference being less than 2 candles. The gas of the smaller companies was 0·25 candle better than the average for the previous year. Some of the small companies make rich petroleum gas, to which some air is usually added to prevent smoky flames. The average illuminating power of the gas last year was 39·04 candles—a decided increase as compared with the preceding twelve months. With regard to purity, the gas of the larger companies contained slightly more sulphur last year than in 1889. The petroleum gases, however, have been found to contain so little of this impurity, that it has not been thought necessary to determine the exact amount. The gas of several companies showed the presence of sulphuretted hydrogen. Mr. Hinman explains that the reason for the failure of so many companies to properly purify their gas is probably to be found in the fact that for a large part of the year, owing to the great scarcity of the variety of coal generally used, companies were compelled to resort to coal containing comparatively large quantities of sulphur, and were glad to get even that. In regard to ammonia, there has not for the last few years been any very great alteration in the average quantity present in the gas manufactured by the various companies in the State, although there have been considerable changes in the gas of some of them.

Returning to the subject of illuminating power, Mr. Hinman says it would seem that in some cases the gas furnished by the Massachusetts companies is capable of improvement in regard to lighting power. The average power of some of the gases could be profitably increased, and in other cases the fluctuations could well be less pronounced. One improvement requires greater expenditure for materials; the other, increased care, or improved apparatus. Generally, the tendency to fluctuate is most pronounced in the richer gases; the poorer gases being less variable in this respect. Other things being equal, it makes little difference to the consumer whether he is supplied with a rich or a poor gas, provided he pays the same price per unit of light. That is, he can just as well afford to pay $2 per 1000 cubic feet for 30-candle gas as $1 for 15-candle gas. However, at present prices of gas-making materials, it seems to be decidedly cheaper for the company to supply the required amount of light by means of as rich a gas as can be conveniently burned without smoke. It is rather difficult to say how rich a gas can be made without exhibiting a tendency to smoke when burned, as the smokiness depends on the kind of gas, the burner, the rate of burning, and the conditions under which the gas is consumed. It may be said that, under ordinary conditions, there is no danger of smoke from 18-candle gas; and some large towns burn successfully a gas as rich as 35 candles. There is not in America any single material that can be economically used for the production of 20 to 30 candle gas; and therefore a mixture must be resorted to. Gas made by the destructive distillation of mineral oil, and having an illuminating power of from 50 to 70 candles, is generally used as an enricher either for water gas which gives no light, or for coal gas giving a light of about 16 candles. Several companies use a mixture of the three gases. Although by means of oil gas any ordinary candle power can be attained, it is not so easy to keep the gas invariably at the desired standard. The problem of mixing two or three gases of quite different qualities under the conditions that are practically presented, so as to obtain a resultant gas of nearly uniform illuminating power, is one that demands great care and constant attention for its solution. When only two gases are to be mixed, as oil gas and water gas, or oil gas and coal gas, the problem is not so difficult as when all three gases are to be mixed. When illuminating water gas and coal gas are mixed, the conditions are generally not favourable for uniformity of candle power. The gases are manufactured separately and afterwards mixed; and if any temporary variation in the rate of production is desired, the make of coal gas is kept unaltered, and the entire change is made in the water gas. Again, the production of coal gas is always kept up day and night, while water gas is usually made only during the day.

Dealing further with the question of the illuminating power of gas, and the burner for testing it, Mr. Hinman says: It may be asked, What is the harm if a gas does fluctuate in candle power, if it is always kept above the legal standard? The answer is that a consumer cannot change his burners for daily, weekly, or monthly fluctuations of the gas, and that each kind of gas needs one particular kind and size of burner to consume it to the best advantage. The consumer should use the burner which is best adapted to the average grade of gas supplied by the company. Then if the gas is richer than usual, the burner is too large, and the gas is apt to smoke; and smoky flames are objectionable in various ways. If the gas is poorer, the burner is too small to burn it properly, and the consumer gets less light, because he is supplied with comparatively poor gas, and also because he does not burn that gas to the best advantage. I am of opinion that the law should be changed so as to define more precisely the burner used in testing gas. The law now provides that, in testing for illuminating value, the gas shall be burned from the burner best adapted to it, which is at the same time suitable for domestic use. Now, the burner which gives the most light, with a given amount of gas, and the burner which is most convenient for domestic use, are far from being one and the same burner. Burners may be divided into two classes—viz., open burners, or those without chimneys; and burners with chimneys, of which the best-known representative is the Argand burner. Open burners are the handiest; but with gases of less than 18 or 20 candle power, Argand burners give higher results. As Argand burners have been in domestic use, especially for reading-lamps, the inspector has used the best attainable Argand for testing coal gas, as it is no more complicated or harder to use than any common Argand. But this improved Argand is of foreign manufacture, expensive, and the flame is rather easily affected by changes of pressure. For these reasons it has never practically come into domestic use in America. There is also another important difference between open and Argand burners. Two gases of different compositions, but giving the same amount of light when burned from the same Argand burner, might differ considerably in value if burned from an open burner. Both carbonic acid and nitrogen reduce the candle power of gases by their presence; but the reduction is not nearly so marked if an Argand burner is used for burning as it is if the gas is burned from an open burner. For example, at one place in the State about one-half the inspections show the gas, when consumed with an Argand burner, to have an illuminating value of about 15 candles; when an open burner is used, the gas gives a light of only from 8 to 10 candles. This gas has been found to contain comparatively large quantities of both carbonic acid and nitrogen. An ordinary gas giving a light of 15 candles when burned from an Argand burner, would give about 12 candles when consumed from an open burner. Gas containing little nitrogen or carbonic acid, and of from 18 to 20 candle power, gives as much light when burned from an open burner as when an Argand burner is used. At the time of the passage of the law, eleven years ago, almost all the gas in this State, with the exception of a little petroleum gas, had an illuminating value of from 16 to 18 candles, and contained little carbonic acid. As the effect of carbonic acid and nitrogen in gas, when burned from different styles of burners, was not fully known, it was thought that the only effect of using an Argand burner for testing would be a general increase of about 3 candles above the results obtained by using an open burner. We now know that, to take an extreme case, the Inspector may report two gases to have illuminating values of 16 and 18 candles, using an Argand burner in making the test, and yet, had the best open burners been used with each gas, the poorer gas would have had an illuminating value only one-half as great as the richer gas. There is on the market a burner—no more expensive, nearly as well adapted to domestic use, and more generally used than the Argand burner now used for testing—which gives very much higher results per foot of gas burned. The Inspector is in doubt if a strict construction of the law does not require him to adopt this new improved burner in testing. He has not done so as yet, as he believes the results obtained by the use of the burner would be of no value to the large majority of consumers using open burners.

EAST LONDON WATER-WORKS COMPANY.

The Directors' Half-Yearly Report.

The report of the Directors of this Company, which will be presented to the proprietors at their half-yearly meeting to-day, states that the revenue for the six months ending at Christmas last amounted to £144,163, as against £138,958 in the corresponding period of 1889; being an increase of £5205. The expenditure on maintenance of works was £44,300, and on management, £10,143—together £54,443—as compared with £42,846 and £8661 in the latter half of the previous period; being an increase of £2936. The Directors regard the augmentation in the revenue as highly satisfactory; and they explain that the additional expenditure arises from the higher price of materials (notably coals) and the cost of the parliamentary proceedings in opposition to the Midland Railway Bill of last session. There was an expenditure of £25,470 on capital account during the past six months, incurred in continuing the extensions at the Lea Bridge station, and in the development of the wells at Lea Bridge and Walthamstow. At the latter place a new compound pumping-engine has been erected. It is gratifying to find that the difficulties encountered during the past four years in connection with this work have now been overcome, and that the sinking in the chalk is proceeding vigorously. The yield of water at the Lea Bridge well and the tunnel driven therefrom is satisfactory, and is now nearly equal to the full capacity of the pumps. The three new triple-expansion engines erected here will shortly be at work. After these engines have been proved, the pumping plant at Old Ford will be disposed of, and the site of the station handed over to the Midland Railway Company. The quantity of water pumped in the half year under review was 7,906,933,152 gallons—being 247,134,222 gallons in excess of that of the corresponding period of 1889; and it was all certified as being pure and well filtered. The new services laid on numbered 1620, as against 1960 in 1889. The total number is now 169,625. With regard to the impending parliamentary inquiry on the Metropolitan Water Supply, the Directors assure the proprietors that the Company's interests will be watched and vigorously upheld before the Committee to whom the various Bills dealing with this matter have been referred. The Directors recommend a dividend at the rate of 8 per cent. per annum, less income-tax, on the ordinary stock. This will absorb £68,822 of the £88,450 available for distribution; leaving a balance of £19,628 to be carried forward.

Belper Water-Works Company.—The Directors of this Company have instructed Mr. W. H. Radford, C.E., of Nottingham, to prepare plans for a large storeage reservoir. The town is now supplied from a number of springs, which yield more water than is required in the winter, but in summer the supply is much restricted; and it is desired to store the winter's surplus for use in summer.

The Public Lighting of Ballymena.—There was a good deal of small talk at the meeting of the Ballymena Town Commissioners on the 23rd ult., on the subject of two tenders which had been received for lighting the town. The Secretary of the Gas Company (Mr. T. C. C. Hood) wrote stating that they were prepared to light, extinguish, and clean the public lamps at 40s. 6d. per lamp consuming 3 feet of gas per hour. This, it was stated in the course of the discussion, was 1s. less than last year's contract; and, there being 166 lamps in the township, the tender would amount to £336 3s. Messrs. J. E. H. Gordon and Co., of London, tendered for lighting the town by electricity. They undertook to light the streets by 24 arc lamps of 1200-candle power each from dusk to midnight throughout the year, and from five o'clock a.m. till daylight from Sept. 12 to March 31, for the sum of £365 per annum; the Commissioners to grant them the sole right of private lighting by electricity for a term of 42 years, and to assist them as far as possible in obtaining a Provisional Order should they desire to apply for one. It was maintained by several members that this tender was not in accordance with the advertisement; and that the streets would be very inefficiently lighted by the 24 arc lamps, as they would only illuminate the principal thoroughfares, and the back streets would be in total darkness. Eventually the Gas Company's tender was accepted.

The Progress of the Gas Workers' Union.—The members of the Gas Workers' and General Labourers' Union had a large meeting at Barking on Sunday, the 29th ult., in celebration of the second anniversary of the formation of the organization. Two platforms were arranged for the speakers; and it was estimated that about 30,000 people were present. Addresses of a congratulatory character were delivered by the General Secretary (Mr. W. Thorne), the Assistant Secretary (Mr. W. H. Ward), and Mr. John Burns. In the course of his remarks, Mr. Burns referred to the recent importation of free labour by the Shipping Federation, and stated that the "blacklegs" were being paid 33 per cent. more than Union men were asking. He would tell these men that "Laws would drop them like a hot potato, as Livesey had done, and there would be nothing left for them but that national scrapheap, the workhouse, or the gaol." These utterances were received with cheers. They were followed by others from Mr. Ward, who stated that if Mr. Livesey—the champion Union smasher—were present, he would see how far he had succeeded. A resolution was passed congratulating the Union on its success, and urging the enactment of an eight-hour day for all classes of labour. Mr. Livesey replied to Mr. Burns in the paper in which the report of his remarks appeared. He said: "I do not charge Mr. Burns with a desire wilfully to mislead his hearers, but the above-quoted random statement is absolutely untrue. The new men who took the places of the strikers here have not been dropped, and never will be, so long as they do their duty. Honour and the interest of the Company alike require that they should be retained. They are better men, morally and physically, and do their work better, than the old hands they have displaced." Mr. Livesey requested the publication of his correction, not on account of the men, who knew the truth and trusted their employers, but because such statements were calculated to mislead the public, and to engender mistrust between employers and employed, and thus do harm to the entire community.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

There is a lull at present in all branches of the agitations over gas matters which have troubled the citizens of Edinburgh during the past month or two. The newspaper letter writer (mostly of the invertebrate anonymous sort) has ceased from troubling; fewer denunciations of the gas, either as to quality or price, are heard; and the great question of the acquisition of the Edinburgh Gas-Works by the North British Railway Company has gone into the Town Council committee stage, preparatory to the fight over the Railway Company's Bill in the House of Commons. A Committee discussed the Bill yesterday; and the result of their deliberations seems to be a resolve to endeavour to concuss the Railway Company to take the gas-works. They put the question in this way, that they protest against the giving of any portion of the Princes Street Gardens to the Railway Company; and they propose to take the opinion of an engineer of standing as to whether the gradients to the east of the Waverley Station would allow of the station being extended in that direction. To extend the station eastwards means the taking of the site of the gas-works; but that is what the Railway Company are not desirous of doing. In the first place, if they can get ground in the gardens, they will get it free of cost, whereas they would require to pay a heavy price for the site of the gas-works. In the next place, to move eastward would be to move their station from the central position it now occupies. They therefore pleaded before the House of Lords Committee that the gradient to the east was too steep to allow of the ground there being utilized for a railway station; and in that they were supported by Major Marindin. This gentleman's support of the Railway Company makes the task of the Corporation an up-hill one; and it is doubtful whether, even with the opinion of an engineer, however eminent, the Corporation would be able to prevail. If common sense is to decide the question, I should say that the station ought, in spite of all objections, to be removed eastwards. But probably most of your readers know, some of them by experience, the vast distance which separates common sense from skilled evidence, and the consequent improbability of its being listened to. One of the proposals of the North British Railway Company is to construct a turntable and two coaling stations in the centre of the East Princes Street Gardens, which would certainly be a most unsightly thing. This, with the fact that the gas-works are looked on by many as spoiling the east-end view of Edinburgh, will lead to a determined effort to have the Railway Company's proposals rejected, in order that the gardens may be saved from desecration and the eastern portion of the city be improved by the removal of the gas-works. But whatever may happen, it will not do for the Corporation to add to their other "offences" the giving away of their works, of which, I am afraid, there is some danger. I know that some of the Corporation, and notably Mr. Colston, are prepared to sell the gas-works cheap, in order to get them out of the way. But then it must not be forgotten that Mr. Colston's residence in Regent Terrace overlooks the gas-works; and therefore his wishes may be dictated partly by personal reasons. It will therefore be necessary for the Commissioners, and the public too, to keep a look-out upon inner as well as external movements in this matter.

It may have been this period of temporary peace which induced the Edinburgh and Leith Gas Commissioners to hold their annual dinner at this time. The event came off last night; and, as last year, it was held in private. I understand that it was a brilliant affair—a splendid repast being provided in the beautiful saloon of the Waterloo Hotel, which is the finest banqueting hall in Edinburgh. The guests, about 60 in number, were presided over by Lord Provost Boyd; and the speeches, with one exception, were pitched in a hopeful key.

The Gas Committee of the Aberdeen Town Council had before them last week the question of introducing the electric light into the city. I gave the figures on the subject (so far as obtainable) a fortnight ago; and though they were substantially correct, the report which was submitted by the Committee showed that they were not literally so. The variations, however, are but slight, and do not alter the position of matters very much. Instead of at once declaring the whole matter off, which would have been received with a howl of execration from all the electric light mongers, they resolved to advertise soliciting offers from electric lighting companies for the supply of the light, the Corporation agreeing to give to any company with whom they may come to terms, all the facilities which they themselves possess under their Provisional Order. This simply means that the Corporation are willing to shift the loss to be incurred upon electric lighting on to other shoulders. It remains to be seen whether any of the numerous inchoate bodies who have for the past two years been dogging corporations all over the country, will be as eager to incur loss themselves as they have been to thrust it on the communities they have been so mercilessly tormenting.

The question of coal contracts for next year was before the Aberdeen Corporation Gas Committee on Thursday, when a Sub-Committee reported that they had divided the coal offered into four lots, and experimented upon them. No. 1, it was estimated, would produce gas of 27·60-candle power, and would cost 27s. per ton. The quantity required would be 31,000 tons; and the necessary advance in the price of gas would be 9d. per 1000 cubic feet. No. 2 would produce gas of 25·28-candle power; and it would cost 23s. 1d. per ton. The quantity required would be 35,000 tons; and an increase of 5½d. per 1000 cubic feet of gas would be necessary. No. 3 would produce gas of 24·53-candle power; and it would cost 22s. per ton. The quantity required would be 36,000 tons; and the necessary increase in the price of gas would be 4½d. per 1000 cubic feet. No. 4 would produce gas of 52·60-candle power; and it would cost 18s. 8d. per ton. As much as 41,000 tons would be required; and the necessary increase in the price of gas would be 1¾d. per 1000 cubic feet. The Sub-Committee recommended that No. 2 should be accepted. There was a good deal of difference in the Committee as to the recommendation of the Sub-Committee; and ultimately, on a division, it was resolved, by four votes to three, to accept lot No. 3. The Committee's resolution has, however, to come before the Town Council; and it may not be adopted by them. During the current year the average price of coal has been 19s. per ton; and the illuminating power of the gas, 25 candles.

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

The eighth annual "informal" meeting of Scottish gas managers will be held in this city next Friday afternoon. Mr. R. Robertson, of Bathgate, President-Elect of the North British Association of Gas Managers, will preside. As at previous meetings of the same kind, no formal papers will be read; but several important questions affecting the gas industry will be submitted for discussion. A certain degree of unusual interest will attach to this year's "informal" by the attendance of Mr. J. Hepworth, of Carlisle, the President of The Gas Institute, who will take part in the proceedings.

At their last meeting, the Glasgow Corporation Gas Committee had under consideration some correspondence which had passed between the Town Clerk, the local Law Agents of the Partick, Hillhead, and Maryhill Gas Company, and the Parliamentary Agents of the Company and the Corporation, with reference to the conduct of the Company's Bill at present before Parliament, and which it is proposed so to alter as to enable the Company to sell, and the Corporation to acquire the whole undertaking of the Company on the terms already agreed upon. It was eventually resolved that the conduct of the Bill should be a join one by the Corporation and the Company. It was also resolved that the necessary alterations in the Bill should be proceeded with by way of additional provisions, unless the Parliamentary Agents of both parties should deem a new Bill expedient. In connection with this matter, I may mention that the deed of agreement in regard to the sale of the Company's undertaking to the Corporation was signed at the same meeting; furthermore, that a meeting of the shareholders of the Company was held in Glasgow yesterday, when the resolution of the Company which was passed at a former meeting to sell the concern to the Corporation for the sum fixed on—namely, £202,500—was confirmed.

Advancing by "leaps and bounds" is again illustrated by the revenue of the Glasgow Gas Trust, whose Treasurer has just reported that the gas rental up to the 25th of March, for the year commencing the 1st of June, 1890, amounted to rather more than £234,800; whereas the 1889-90 drawings up to the corresponding time a year ago amounted to a little over £208,600. There has thus already been an increase in gas-rental for this year of about £26,200! When "notes were compared" more than a fortnight ago, the revenue from the sale of residual products showed a relatively larger increase for the year. For 1889-90, the revenue at the time indicated amounted to fully £65,000; whereas for the corresponding period of the present year (nearly 9¾ months) the revenue from that source was almost £76,900—thus showing an increase amounting to upwards of £11,300!

The amount of gas made at the Glasgow gas-works during the month of February was upwards of 376,000,000 cubic feet; so that there was an increased production to the extent of 40¾ million feet compared with the make of February, 1890.

With reference to the tenders sent in to the Glasgow Corporation Special Committee on Electric Lighting, I understand that there were actually five offers put in; the fifth being that of the Brush Electrical Engineering Company, Limited. The members of the Committee are at present puzzled as to whether they should recommend the Corporation to lay down and maintain the necessary works and plant for generating and supplying electricity within the "compulsory area" of the Provisional Order, or transfer their powers and liabilities to one or other of the Companies that have offered for the work—subject, of course, to a satisfactory arrangement being made with the selected Company, upon the basis of the tender sent in by them. So far as I have learned since the deputation from the Committee returned from Bradford and Leeds, they have not obtained such an amount of satisfactory and reliable information by their trip to Yorkshire as will enable them to resolve "right away," and without any hesitation, as to the best method of discharging their special functions at this peculiar crisis. They certainly are face-to-face with a very serious difficulty; and they need all their discretion to enable them to overcome it to the benefit of the community at large.

Last Saturday a special meeting of the shareholders of the Lockerbie (Dumfriesshire) Gas Company was held, when it was unanimously agreed to dispose of the Company's undertaking to the Police Commissioners of the Burgh, in accordance with the terms of the Burghs Gas Supply (Scotland) Act, 1876—the terms to be mutually agreed upon or fixed by arbitration.

At the next meeting of the Glasgow Section of the Society of Chemical Industry, which is to be held on Monday evening, there are to be submitted three communications, all of which are to deal with matters in which gas managers can scarcely fail to take some interest. Mr. Fred. J. Rowan, C.E., is to read some notes on the "Physical Conditions Existing in Shale Distilling Retorts;" the "Determination of Impurities in Paraffin Scale, &c.," will be discussed by Mr. J. S. Thomson; and Mr. J. Gray will describe an apparatus for determining the flashing points of heavy mineral oils. In view of the Inflammable Liquids Bill now before Parliament, the last-mentioned subject becomes one of very special interest and importance.

The Glasgow pig iron market has again been very flat this week. Scotch warrants fell from 43s. 1½d. per ton on Tuesday to 42s. 4½d. on Thursday; closing yesterday with buyers at 42s. 5½d. per ton cash. Cleveland iron began at 38s. 9d., went down to 37s. 10½d., and finished at 38s. 0½d. per ton cash. Hematite iron warrants fluctuated in price from 47s. 7d. to 46s. 10½d. per ton; the close yesterday being 47s. 1d. per ton. There is no new special feature to report. The sellers of iron evidently consider that with dull trade there is no immediate prospect of any great advance in prices. At the same time, a feeling is beginning to manifest itself, that at present prices iron is a safe investment; and it is thought that if consumers, who are just now buying from hand to mouth, were to begin to lay in their usual stocks, a sharp rally might be experienced. The number of blast furnaces in actual operation has now risen to 41, as compared with 37 that were in operation a week ago.

Prices of coal in the Glasgow district, and generally throughout the West of Scotland, are about 3d. per ton cheaper than they were a week ago. The shipping demand is not improving as rapidly as might have been expected, and the home demand is in many instances falling away.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 4.

Sulphate of Ammonia.—The market has not recovered the firm tone which prevailed before the holidays; and the present dulness is made a vehicle of to introduce into sellers' minds unfavourable views as regards the future. Now, if nitrate is excepted, there is not the slightest change in the position, beyond the fact that, encouraged by the present tone of the market, forward business is readily entered into by one set of dealers, while another set is making haste to cover in their April shorts at the lower rates practicable to-day. Hull is to-day quoted at £11 5s. But very few makers' parcels have changed hands thereat, as generally there is no pressure to sell; and it is simply playing into the hands of the speculators to force sales at the present moment. It has puzzled country producers that the London quotations should be reduced so early in the month, without testing the possible demand, which, as far as foreign consumers are concerned, will unavoidably be later this season, owing to the backward and cold spring—the weather being even more severe abroad than here. And it seems to be entirely overlooked that the shipments, whatever may be reported to the contrary, are fully up to the mark—as can be easily ascertained by anybody desirous to satisfy himself upon this point. As regards nitrate, westerly winds have brought up supplies more freely; and cargoes have receded about 10s. per ton in value. The position of this commodity is, however, on the whole a more satisfactory one, as the large excess of the visible supply over that of last year has almost completely disappeared, as the figures at the end of March will show. The quantity afloat, and in stock in Europe, at that date was:

1889.	1890.	1891.
354,000 tons ..	352,000 tons ..	365,000 tons

During the past three months the consumption has been 25,000 tons in excess of that of last year. It may be fairly left to the intellectual sulphate manufacturer, after what has been said, which path to pursue as regards the disposal of the declining production. No advice is tendered here as regards the holding of the make for better prices, in view of the speculative proclivities of the age, and how "bear" operations so frequently ruin the healthiest of markets.

LONDON, *April* 4.

Tar Products.—Benzol buyers appear to have closed their books; and with the result that it is "sick" and quite unsaleble. The price quoted below is only nominal, as there is no business doing in them. Fortunately makers are well sold, and stocks are low. It is believed that the present depression is only of a temporary character, although from the market position of the article, it is more than likely that prices will still further go down, before the better comes. Pitch is somewhat stronger, and important sales are reported. Creosote oil continues dull; makers holding heavy stocks. Anthracene is in fair request; but not quite so strong as it was a week or two ago. Prices are: Pitch, London, 35s.; country, 32s. 6d. Benzol, 90 per cent., 4s. 3d.; 50 per cent., 3s. 1½d. Toluol, 1s. 9d. Solvent naphtha, 1s. 7½d. Crude naphtha, 1s. 6d. Creosote, 1¾d. Carbolic, 35 crystals, 5½d.; crude, 60's, 1s. 5½d. Cresol, 10d. Anthracene, "A" quality (30 per cent.), 1s. 4d.; "B" quality, 1s.

Sulphate of Ammonia.—After a spurt, which cleared away considerable stocks (from country makers particularly), sulphate is again weaker; and although there is a large home demand and consumption going on, prices are quoted from £11 to £11 5s. Ammoniacal liquor is in fair request, at 5s. 6d. to 7s. 6d., having regard to position.

The Salary of the Southampton Water-Works Engineer.—A resolution was passed at the last meeting of the Southampton Town Council by which the salary of the Water Engineer (Mr. W. Matthews) was raised to £350 per annum, to be further increased during the next three years by £20 per annum.

Proposed Re-Imposition of the London Coal and Wine Dues.—A movement is on foot among some of the local authorities of the Metropolis, having for its object the re-imposition of the lately-abolished duty upon coal and wine imported into the Metropolitan area. Many Vestries and District Boards have signified their desire to have these duties restored, having regard to the fact that the price of coal to the London consumer has in no degree been cheapened by the remission of the impost upon coal, while the deficit which the abandonment of this source of revenue has caused, entails an additional burden upon the householders of the Metropolis to provide open spaces and carry out improvements, funds for which were formerly furnished by the dues.

Brighton and Hove Electric Light Company.—The annual meeting of this Company was held on the 24th ult. Mr. Robert Hammond presided; and in moving the adoption of the report and balance-sheet, said he would like to draw attention to the fact that the year's trading showed a balance of profit of £768; and, after deducting debenture interest and bringing forward the balance from the previous year, there was available for division an amount of £1202. From this it was proposed to pay a dividend of 5 per cent. on the ordinary share capital of the Company (£15,000). The dividend would absorb £750; and out of the balance it was intended to write off a third of the £697 which figured to the debit of the "suspense account, Garman case," and was the amount of indemnity the Company had to pay in connection with the sad accident which was attributed by some to the Company's negligence. The remaining £220 would be carried forward to the credit of the profit and loss account. It was already well known to the shareholders that the Company's application for a Provisional Order in the session 1889-90 was not successful. But they had renewed their application, limiting the area to the portion of Brighton which lay outside the proposed Corporation area; and in the event of their obtaining the Order, the Company would withdraw their wires and opposition in the Corporation area. Should, however, the application for the Provisional Order not be successful, the Company would continue to supply the whole of Brighton, and would trust to their system, and the greater economy which was possible under it, to make satisfactory headway against the competition of the Corporation. The motion was carried.

Sale of Shares in the Maidstone Water Company.—Last week three £10 ordinary 7 per cent. shares (1880 issue) in the Maidstone Water Company were sold at £15, £16, and £19 each, and three £10 preference 5 per cent. shares at £14 each.

The Consumption of Gas at Lymm.—In his report to the members of the Local Board last week, Mr. W. Severs, the Manager of the Lymm Gas-Works, stated that there had been during the year ended the 25th ult. an increase of 364,000 feet in the gas made, and of 360,000 cubic feet in the quantity used by private consumers.

The Price of Gas at Burnley.—The Burnley Gas Company have decided to reduce the price of gas in the out-districts from 3s. 4d. to 3s. 6d. per 1000 cubic feet, less 10 per cent. discount, or a net reduction of 3½d. Alderman Collinge informed the Town Council last Wednesday, that the loss in revenue to the Committee on the present consumption would be £72 a year. During the past twelve months, however, there had been an increase of 24 per cent. in the consumption of gas.

The Electric Lighting Question at Brighton.—The conflict between the Electric Light Company and the Brighton Corporation assumed another phase at the meeting of the Town Council last Thursday, when the Lighting Committee reported that they had received a letter from the Company proposing that the Corporation should treat for the purchase of the undertaking. The Committee recognized that the Company had some claim, and recommended negotiations. This was deemed inexpedient by several members; and a negative amendment was submitted. A lengthened discussion ensued; but the report was ultimately adopted.

The Lancashire Coal Trade.—There is a steadier tone about the market than was the case a week ago; and prices are firmer except for the lower qualities of slack, of which there is an increasing supply without any corresponding demand. The better sorts of slack are quoted at 7s. 6d. to 7s. 9d. per ton at the pits; and a good medium quality can be had at 6s., with commoner qualities ranging down to 4s. 3d. There has been an improvement in the demand for house coal; and in some directions there is difficulty in keeping pace with the orders given. Prices are, however, practically the same—the best being quoted at 12s. 6d. per ton; seconds, from 10s. 6d. to 11s.; and common round, 9s. Steam coal and descriptions suitable for iron-making purposes may generally be said to remain unchanged in quotation, with a moderate business doing.

Extension at the Portwood Gas-Works of the Stockport Corporation.—At a meeting last week of the Stockport Corporation Gas Committee, the newly-appointed Gas Engineer (Mr. S. Meunier) reported that he had examined the works and the plan of the retort-house at Portwood, with the result that he did not think it possible to extend the present house, to ensure a proper supply of gas and the erection of a satisfactory building. He advised an extension of the retort-bench, and covering it over with a temporary structure, whereby sufficient extra retorts might be utilized to keep up the supply to the consumers, and give ample time for deciding as to future extensions. After some discussion, Mr. Meunier was requested to prepare a rough sketch of the temporary structure required, the estimated cost, and drawings of the retort-settings that he would advise to be erected. At a further special meeting of the Committee, it was resolved that a grant of £100 be made to the late Engineer (Mr. James Jacques) in consideration of the extra services entailed upon him during the year 1889-90 by the erection of a new tank and gasholder at the Portwood works.

Northern Coal Trade.—Very full demand is shown for best Northumbrian steam coal; and the price is now firm at 12s. per ton, free on board. All the collieries are well employed; and as the opening of the Russian chief ports in the Baltic may be expected in a week or two, a pressure in the demand for this class of coal may be expected. Second-class coals are about 1s. per ton less. Small steam coals are 5s. to 5s. 6d. per ton—an advance on recent prices. On the other hand, some of the Durham coals are a little weaker, owing to the usual falling off in demand for gas and household kinds at this time of the year, and the putting of the coals from the Londonderry collieries again in the market. For best gas coals, the figure is now not more than 10s. per ton, free on board, and lower rates are accepted—down perhaps to 9s., according to the quality. It is said that some of the large Metropolitan contracts have been placed; but nothing is known as to the actual price and quantity. The local inquiry for gas coal is low, and will further fall for two months at least. Blast-furnace coke is steadier in demand; but the blowing-out of one or two furnaces has rather weakened prices. For export, from 17s. to 18s. per ton is asked. Gas coke is unaltered; but there are still rather heavy stocks at some of the inland gas-works, though the production is now less than it has been.

Abolition of Gas-Meter Rents at Blackburn.—The Blackburn Town Council, at their monthly meeting last Thursday, adopted the recommendation of the Gas Committee to abolish gas-meter rents and increase the price of gas by 1d. per 1000 cubic feet. There was some opposition to the Committee's proposal; and a long discussion took place regarding it. Generally, those in opposition were favourable to the abolition, but objected to the increase in price. Mr. Walsh, in fact, proposed an amendment to the effect that the abolition should be arranged upon a sliding scale, and that the charge for gas should remain as now. In support of his amendment, he stated that there are in the borough 5000 houses in which no gas is consumed; and he thought the occupiers might be induced to use it if meter-rents were abolished and the price left at its present figure. Alderman Whiteley seconded the amendment. He said he thought the best way would be to take off 3d. from the rental this year, and 2d. in succeeding years. He objected strongly to the price of gas being increased. Mr. Hamer pointed out that, according to figures given by Alderman Walsh, the average consumption of gas in cottages was 8000 cubic feet per annum; and this, at 3s. per 1000 cubic feet, meant an annual charge of 24s. By abolishing meter-rents, they were practically making a reduction of 2s. 4d. a year; and they were increasing the price of gas by 1d. The net reduction, therefore, was 1s. 8d. a year. The minutes were confirmed by 36 votes to 6; and the resolution will take effect from the 24th of June next.

Presentation to Mr. Hole, of Rochester.—An interesting event took place at the Gas Offices, Rochester, on Tuesday last, when Mr. Walter Hole, who had then just completed his seventh year's service as assistant out-door superintendent to the Rochester Gas Company, was presented by Mr. C. Bird (the Superintendent), on behalf of the out-door staff, with a beautifully chased telescopic gold pencil case as a token of the respect and esteem he has won from them during the time he has been in connection with the Company.

The Profits of the Manchester Gas Department and the Price of Gas.—A requisition was recently presented to the Mayor of Manchester (signed by a large number of influential ratepayers) requesting him, at his earliest convenience, to call a public meeting for the purpose of considering the advisability or otherwise of transferring from the Gas Department to the city fund profits derived from the manufacture and sale of gas and residual products; also to consider the advisability of charging for gas at cost price, with a view to its more general use for heating purposes instead of coal, so as to lessen the present excessive pollution of the atmosphere, and reduce the high death rate. The Mayor replied that, upon full consideration, he had come to the conclusion that the subject was eminently one for the consideration of the Gas Committee and the Council, and that the circumstances did not call for a public meeting on the subject. He therefore regretted that he was unable to comply with the request contained in the memorial.

The Public Lighting of Folkestone.—At the last meeting of the Lighting Committee of the Folkestone Town Council, the question of the appointment of an Arbitrator on the Gas Company's charges for the public lamps was again discussed. It was reported that the Town Clerk had been in communication with the Gravesend authorities about the dispute some years ago between the Gravesend Improvement Commissioners and the Gravesend and Milton Gas Company, when the present Mr. Justice Denman was appointed Arbitrator. One of the points submitted by the Commissioners was whether the local authority could insist upon gas being supplied to the public lamps at a less price than was paid by ordinary consumers; and to this Mr. Justice Denman gave a negative decision. Substantially, the award was in favour of the Company; and the arbitration cost the ratepayers something like £1000. The Folkestone Town Council have already passed a resolution that an Arbitrator be appointed; and it was moved at the Lighting Committee that the Arbitrator be Mr. Corbet Woodall. The resolution was not, however, carried; and it was ultimately resolved to leave the matter for consideration at the next meeeting of the Corporation.

The Rating of Public Works in Scotland.—The old question of the rating of public works has been once more fought in the Court of Session. This time the appeal related to the valuation of the Dumbarton Water-Works—an undertaking which is managed by the Magistrates of Dumbarton. Prior to last year the works were valued at £1000; but in July last, a county ratepayer having complained that the valuation was less than the true worth of the works, the Valuation Committee had the parties before them. The Committee raised the valuation to £2501; arriving at this figure by taking the income for the year 1888-9 as an average. An appeal was brought by the Magistrates; and Lords Wellwood and Kyllachy decided it upon the old lines—affirming the decision of the County Valuation Committee. In the course of the discussion, Lord Kyllachy made the remark that when all the mortgages are paid up, and the only income requiring to be raised is to cover working expenses, the valuation will be *nil*. In disposing of the appeal, too, Lord Wellwood, in the same spirit, said that the fixing of the value of public undertakings, the statutes relating to which forbade that profits should be made from them—viz., to value an undertaking as if it were let to a private trader—was a mode which probably would not stand the test of time; but in the meanwhile the Court were bound by previous decisions. So that, unless legislation steps in to remedy the grievances of which corporations complain, it is only a matter of time when the rural local authorities, who at present are all for the mode of valuing which has found favour, will be contending that it no longer applies, because they do not derive any rates from the undertaking in their area; and then the whole question of rating will have to be fought over again.

Gas Affairs at Salford.—Last Tuesday, there was a meeting in Manchester of representatives of the Eccles and Swinton Local Boards to consider the refusal of the Salford Corporation Gas Committee to abolish the differential rate charged for gas. The attitude of the Council in this matter was debated at some length; and eventually it was unanimously agreed to offer the most strenuous opposition to the Bill of the Corporation, which contains a clause relative to the retention of the rate in question. On the following day, at the monthly meeting of the Council, the Gas Committee recommended a reduction of 2d. per 1000 cubic feet in the price of gas to all consumers. Mr. Alderman Husband said he thought that the present price (2s. 6d. per 1000 cubic feet) was very moderate; and instead of reducing it, the Corporation should devote the surplus profits from the gas-works to the reduction of the rates, which were likely to be higher this year than last. They had 44,000 ratepayers, and only 18,000 gas consumers; and they ought to reduce the rates 2d. in the pound, and so benefit the greater number, instead of reducing the price of gas for the benefit of a smaller number of persons. Mr. Phillips, the Deputy Chairman of the Gas Committee, held that it was most desirable to keep down the price of gas, in order to increase the consumption, and that it was an unsound principle to tax the gas consumers and the industries of the borough, which were very largely dependent on the use of gas, for the benefit of the ratepayers generally. Mr. Snape and Mr. Rudman bore testimony to the efficiency with which the new Gas Committee were doing their work; the latter mentioning that they had reduced the price of gas in the borough 25 per cent., and outside the borough 30 per cent. The recommendation was adopted. In connection with the large extensions to be made at the Liverpool Street Gas-Works, it was resolved to accept the contract of Messrs. Dennis and Butler, for the erection of the new retort-house. The cost of this part of the undertaking is estimated at £21,580.

The Hours of Labour at the Wandsworth and Putney Gas-Works.—In one of the London daily papers on the 27th ult., there appeared a statement that the men employed at the Wandsworth and Putney Gas Company's works had been informed by the Engineer (Mr. H. S. Freeman) that they were to go back to the twelve-hour system; and that concurrently with this order a reduction had been made in wages. Mr. Freeman says there is absolutely no truth in these assertions. The Assistant-Secretary of the Gas Workers' Union, however (Mr. W. H. Ward), has explained—doubtless in justification of the original statement—that he was told by the men that the pipe-cleaners, who had been working on the eight-hour system for the past 18 months, had been put back to the twelve-hour system; and that further, in slackening hands, some of them were being employed at coal-trimming, at which they had to work twelve hours for 4s. The men thought this was only getting in "the thin end of the wedge;" and consequently they consulted the officials of the Union as to what steps they should take. Mr. Ward says the Union will make any sacrifice before allowing members to revert to the old system of working.

The Scarcity of Water in the Rhondda.—At the Pontypridd Police Court last Wednesday week, the Ystrad Gas and Water Company were summoned by Mr. William Lewis, of Clydach Valley, for neglecting to supply certain houses owned by him with a sufficiency of water. There were four summonses; and with regard to two of them, it was alleged that the water was impure, as well as inadequate in quantity. Evidence was given by the occupants of one of the houses, and by the plaintiff, as to the insufficiency; and Dr. James deposed to the river from which the Company derived their supply being contaminated above the intake. This it was ascertained in cross-examination was 4 miles from plaintiff's houses; and it was contended, on behalf of defendants, that it must be shown that the water in the pipes supplying the house was impure. The Engineer of the Company (Mr. Rees) stated that since August last they had spent £10,000 in improving their property; and these improvements, consisting of new filter-beds, &c., would be completed in a few days. The Bench expressed the opinion that there was not sufficient evidence as to the impurity of the water supplied by the defendants to sustain a legal conviction. They hoped, however, the Company would use every effort to improve the present state of things, and place the water above suspicion. With regard to the charge of insufficiency, they considered it proved, and inflicted a fine of £5 and costs in each case.

The Cardiff Corporation and the Contractor for the Taff Vawr Water-Works.—The relations between the Water Committee of the Cardiff Corporation and the contractor for the Taff Vawr Water-Works (Mr. J. Mackay) have recently been anything but friendly. Mr. Mackay asserts that he has experienced large losses owing to undue interference with his men; but the Engineer (Mr. J. A. B. Williams) denies that this is so. An offer was made by the first-named gentleman that for £25,000 he would hand over to the Corporation the plant, railway, and all pertaining to the contract. The Committee, however, after consideration, stated that they would recommend the Council to pay him £15,000, including £5542 money retained by the Corporation up to Feb. 19 last. This he refused to accept. The matter then came before the Council at their meeting last Tuesday week, and was discussed at great length. The Committee recommended the Council to release Mr. Mackay from the contract, and to pay him £17,500, including the sum retained, but exclusive of £1857, the amount of the last unpaid certificate, and all work done since the date thereof and up to the date of completion of the proposed arrangement, and the clay dug and weathering in the clay-field and red sandstones selected for pitching, which were to be paid for upon the certificate of the Engineer. This recommendation was to be subject to certain terms and conditions fully set forth; among them being that Mr. Mackay was to hand over all plant and materials to the Corporation, and that he was to assist them in any matter, free of cost, for the carrying out of the arrangement contemplated. In the course of the discussion, the remarks made by Alderman Jones, the Chairman of the Committee, showed that, if the proposal was not agreed to by the Council, and if they insisted that Mr. Mackay should carry out his contract, a great deal of trouble was likely to arise. An amendment to the motion for the adoption of the minutes was proposed, calling on Mr. Mackay to complete his contract, but it was negatived by a large majority, and the original motion was carried.

The Exeter Electric Lighting Company and the City Council.—The Exeter City Council and the Electric Lighting Company have had a long dispute with regard to certain provisions in the Order which the latter are applying for; the chief point in question being the periods at which the Council may have the option of purchasing the Company's undertaking. At the last meeting of the Council, a report was presented by the Parliamentary Committee, in which it was shown that they had submitted these terms to the Company—"That the Council have the option of purchasing the works and undertaking of the Company at the end of 25, 30, and 35 years from the time of the granting of the Order upon the terms set out in section 2 of the Electric Lighting Act, 1888, with the following additions: If the option is exercised at the end of 25 years, the Council to pay the Company a sum equal to the net profits made by the Company during the preceding five years. If at the end of 30 years, a sum equal to the net profits made by the Company for the preceding three years. If at the end of 35 years, a sum equal to the net profits made by the Company in the preceding two years." The Company replied that they would agree to the Council's proposal if the earliest period for the option of purchase was fixed at 28 years, the option only to arise at 28 and 35 years. The Committee resolved to recommend the Council to accept the proposal submitted by the Company. The adoption of the report having been moved, an amendment was proposed to the effect that, while retaining the first period of optional purchase by the Council of the Company's undertaking at 25 years, the Council were willing to make the second optional to arise at the end of 32 years instead of 30 years; thus giving the interval of seven years for which the Company ask. The added profits at the two periods to be those of five years and three years respectively. The amendment was carried by 22 votes to 16.

The New Water-Works for Oldham.—The Strinesdale Tunnel, in connection with the Castleshaw water-works scheme of the Oldham Corporation having recently been completed, the Water Committee a few days ago paid an official visit, and were pleased with the satisfactory way in which the work has been executed. The tunnel is about 2423 yards in length, and has been driven from Strinesdale in the one direction, and Farther Heyes (Delph) in the other. About 2060 yards are brick-lined, leaving a length of 360 yards unlined where hard rock exists. Some 95,000 bricks have been used, giving an average of 460 per lineal yard. The section of the tunnel completed is 5 ft. by 5 ft. with a flat invert, straight side walls, and an arch top. Two rings of bricks are used all round. The floor or invert is concreted where the ground is shale; but no concrete is put in where the floor is rock. More than 11,000 cubic yards of excavations have been removed by the miners, requiring 12,150 lbs. of tonite and 8350 lbs. of powder in blasting. The cost, it is stated, has been considerably less than the estimate.

Re-Arrangement of the Staff of the Liverpool Corporation Water Department.—At the meeting of the Liverpool City Council last Wednesday, it was resolved that the grant by the Council of the 4th of March, of an annual allowance of £300 to Mr. Alexander Duncanson, Deputy Water Engineer, in consideration of long service and failing health, be sanctioned by the Council, pursuant to the 60th section of the Liverpool Improvement Act, 1882; that Mr. R. T. Martin be appointed Resident Superintendent of works and buildings at Lake Vyrnwy, at his present salary until Dec. 31 next, and from that date at a salary of £200 per annum, with the use of a house and garden; that Mr. William Davies be appointed Superintendent of the Vyrnwy aqueduct and filter-beds at a salary of £300 per annum; that in consequence of the superannuation of Mr. A. Duncanson, Mr. Thomas Duncanson, principal draughtsman at Lake Vyrnwy, be appointed Assistant Engineer at a salary of £350 per annum; and that Mr. T. Fazakerley, superintendent of pipe laying and repairs be paid £250 instead of £225, in consideration of additional duties and responsibilities in connection with the laying of new mains and re-piping.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 639.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	10 Oct.	10½	Alliance & Dublin 10 p. c.	10	16½—17½	..	6 0 0
100,000	10	"	7½	Do. 7 p.c.	10	12½—13½	..	5 11 1
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	106—108	..	4 12 7
100,000	20	27 Nov.	8	Bahia, Limited	20	14—16	−1	10 0 0
200,000	5	13 Nov.	7½	Bombay, Limited	5	6½—7½	..	5 3 5
40,000	5	"	7½	Do. New	4	5—5½	..	5 9 1
380,000	Stck.	26 Feb.	12½	Brentford Consolidated	100	212—217	..	5 12 10
125,000	"	"	9½	Do. New	100	155—160	+2	5 15 7
220,000	20	12 Mar.	11½	Brighton & Hove Original	20	40—42	+1	5 9 6
320,000	20	28 Mar.	11½	British	20	44—46	..	4 17 10
50,000	10	12 Mar.	11	Bromley, Ordinary 10 p. c.	10	18—20	..	5 10 0
39,000	10	"	8	Do. 7 p. c.	10	13—15	..	5 6 8
328,750	10	13 Nov.	6	Buenos Ayres (New) Limited	10	10—11	..	5 9 1
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	100—103	..	5 16 7
150,000	20	26 Feb.	8	Cagliari, Limited	20	25—27	..	5 18 6
550,000	Stck.	10 Oct.	13½	Commercial, Old Stock	100	257—262	+2	5 4 11
130,000	"	"	10½	Do. New do.	100	198—203	..	5 5 11
130,000	"	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	121—126	+1	3 11 5
557,320	20	30 Dec.	13	Continental Union, Limited	20	48½—49½	+½	5 5 0
242,680	20	"	13	Do. New '69 & '72	14	33—34	+½	5 7 0
200,000	20	"	10	Do. 7 p. c. Perf.	20	37—39	..	5 2 6
75,000	Stck.	25 Mar.	10	Crystal Palace District	100	195—205*	..	4 17 7
486,090	10	28 Jan.	4†	European, Limited	10	19½—20½	..	—
354,060	10	"	4†	Do. Partly paid	7½	14—15	..	—
5,470,630	Stck.	12 Feb.	13	Gaslight & Coke, A, Ordinary	100	239—243	+1	5 7 0
100,000	"	"	4	Do. B, 4 p. c. max.	100	96—99	..	4 0 10
665,000	"	"	10	Do. C, D, & E, 10 p.c. Pf.	100	251—256	+3	3 18 1
30,000	"	"	5	Do. F, 5 p. c. Prf.	100	118—123	..	4 1 3
60,000	"	"	7½	Do. G, 7½ p. c. do.	100	174—179	..	4 3 9
1,300,000	"	"	7	Do. H, 7 p. c. max.	100	161—165	..	4 4 10
463,000	"	"	10	Do. J, 10 p. c. Prf.	100	248—253	+2	3 19 0
476,000	"	"	—	Do. K, 6 p. c. Prf.	100	148—153	..	3 18 5
1,061,150	"	12 Dec.	4	Do. 4 p. c. Deb. Stk.	100	113—118	..	3 7 10
294,850	"	"	4½	Do. 4½ p. c. do.	100	122—126	..	3 11 5
908,000	"	"	6	Do. 6 p. c. do	100	165—170	..	3 10 6
3,800,000	Stck.	13 Nov.	12	Imperial Continental	100	230—235	+1½	5 2 1
75,000	5	12 Dec.	6	Malta & Mediterranean, Ltd.	5	5—5½	..	5 9 1
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	100	110—112*	..	4 9 3
541,920	20	27 Nov.	6½	Monte Video, Limited	20	18—19	..	6 16 10
150,000	5	27 Nov.	10	Oriental, Limited	5	8½—9½	..	5 8 1
60,000	5	25 Mar.	7	Ottoman, Limited	5	4½—5½*	..	6 13 4
166,870	10	26 Feb.	2	Pará Limited	10	3½—4½	..	—
420,000	100	3 Nov.	6	People's Gas of Chicago—1st Mtg. Bds.	100	95—100	..	6 0 0
500,000	100	1 Dec.	16	2nd Do.	100	93—98	..	6 2 5
150,000	10	10 Oct.	10	San Paulo, Limited	10	16—17	..	5 17 8
500,000	Stck.	26 Feb.	15½	South Metropolitan, A Stock	100	280—285	+3	5 8 9
1,350,000	"	"	12	Do. B do.	100	235—240	+5	5 0 0
166,500	"	"	13	Do. C do.	100	240—245	+3	5 6 1
678,000	"	30 Dec.	5	Do. 5 p. c. Deb. Stk.	100	140—145	..	3 9 0
60,000	5	12 Mar.	11½	Tottenham & Edm'nton, Orig.	5	11—13	..	4 8 5
				WATER COMPANIES.				
729,221	Stck.	30 Dec.	10	Chelsea, Ordinary	100	268—273	..	3 13 3
1,720,560	Stck.	10 Oct.	8a	East London, Ordinary	100	216—220	+1½	3 12 9
544,440	"	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	140—145	..	3 2 0
700,000	50	12 Dec.	9	Grand Junction	50	118—123	−2	3 13 2
708,000	Stck.	12 Feb.	10½	Kent	100	270—280	−2½	3 15 0
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	250—255	−1	3 14 6
406,200	100	"	7½	Do. 7½ p. c. max.	100	197—202	..	3 14 3
260,000	Stck.	25 Mar.	4	Do. 4 p. c. Deb. Stk.	100	116—123*	..	3 5 0
500,000	100	12 Feb.	12½	New River, New Shares	100	357—362	..	3 6 11
1,000,000	Stck.	28 Jan.	4	Do. 4 p. c. Deb. Stk	100	125—128	..	3 2 6
902,300	Stck.	12 Dec.	7	S'thwk & V'xhall, 10 p. c. max.	100	175—180	..	3 17 9
126,500	100	"	7	Do. 7½ p. c. do.	100	168—173	..	4 0 11
1,155,066	Stck	12 Dec.	10	West Middlesex	100	260—265	−3	3 13 6

*Ex div.

† Interim dividend. a Next dividend will be at this rate.

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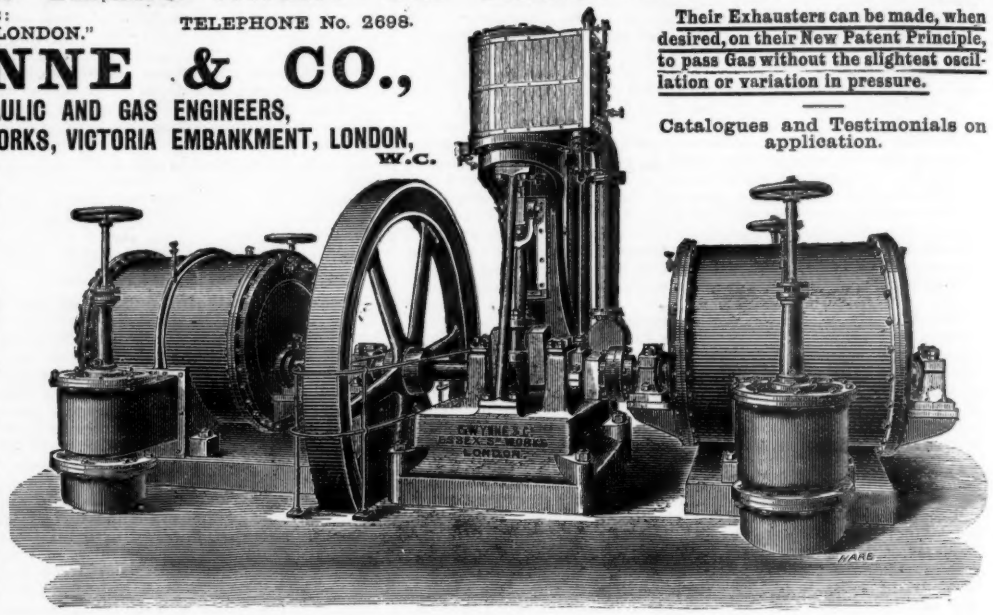

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Exhausting Machinery at Fulham and Bromley Gas-Works—each set passing 400,000 cub. ft. per hour, drawing 14 miles distant from Beckton.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

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City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

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JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.

Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE, NEAR DALKEITH, }

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HUGH WALLACE & CO., Chemical Manufacturers (the old-established firm), supply the above, which is specially adapted for making White Sulphate of Ammonia. The latter purchased in any quantity at highest market prices, or contracts for the year.

For prices and terms apply Botolph House, Eastcheap, LONDON, EC.

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Head Office: MIDDLESBROUGH. Correspondence invited.

TAR and Liquor wanted. BROTHERTON AND CO., Commercial Buildings, LEEDS.

ENGINEER'S Assistant, occupying premier position at large Gas-Works, wants engagement. First-rate Draughtsman (general and detail drawings, specifications, and quantities of buildings and plant), and good Surveyor and Clerk of Works. Home or abroad.

Address No. 1934, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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*** See Advertisement p. 632 of this week's issue.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Address: "Braddock, Oldham."

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 665.

Inquiries should be addressed to THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86-88A, LEADENHALL STREET, E.C.

WANTED, a Situation as Working MANAGER in a Gas-Works making from 7 to 20 million cubic feet per annum. Has had good practical experience in Carbonizing, Fitting, Main and Service Laying, Reading and Testing Meters, and Repairs connected with Gas Plant. Good testimonials and references. Abstainer. Married.

Address No. 1928, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Working Foreman, thoroughly experienced in Gas Making, and capable of taking charge and management of the Burgess Hill Gas-Works, laying and testing Mains, fixing Retorts, taking Meters, &c. Salary, 35s. a week, with good House and Garden, and Coal and Gas free.

Apply, stating age, and enclosing testimonials (two) to the SECRETARY, Gas-Works, Burgess Hill, SUSSEX.

STOKE CORPORATION GAS-WORKS.

THE Stoke Corporation Gas Committee require the services of a SECRETARY, from the 7th of May next, at a salary of £130 per annum. A schedule of the duties can be seen at the Office of the Town Clerk.

Applications to be sent under cover, addressed to the Chairman, Geo. Teason, Esq., Ashfield Cottage, Stoke-on-Trent, and endorsed "Application for Gas Secretaryship," not later than the 13th of April inst.

JNO. B. ASHWELL, Town Clerk.

3, Brook Street, Stoke-on-Trent.

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GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. OXIDE PAINT, SULPHURIC ACID, & Chemicals.

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MANCHESTER ELECTRICAL STORES.

FOR Batteries, Bells, Wires, and Special Electrical Apparatus, address the best house 17, NEWTON STREET, PICCADILLY, MANCHESTER.

WANTED, on the 1st of May next, a WORKING FOREMAN for a small Gas-Works carbonizing about 400 tons of Coal yearly.

Applicants must state age, and wages required (good House, Garden, Coal, and Gas found), and send in their references not later than the 17th inst. to THOMAS C. WILLDERS, Secretary, Gas Company, HOLBEACH.

Holbeach, April 2, 1891.

WANTED, at a Gas-Works, a trust- worthy and energetic MAN to keep the Books. Preference given to a man who is now in a similar position, and one well acquainted with the general routine work of a Gas-Works. Wages to commence with 25s. per week.

Apply, by letter, stating age, with not more than three recent testimonials, to No. 1933, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS MANAGER.

THE Trustees of the District and Harbour of Maryport require at once for their Gas-Works, a MANAGER who is thoroughly conversant with the Manufacture and Distribution of Gas and the Manufacture of Sulphate of Ammonia. Make about 80 millions. Salary £100 per annum, with free House, &c.

The candidate will be required to devote the whole of his time to the duties of his office.

Canvassing not allowed.

Applications, in own hand-writing, stating age, qualifications, and experience, accompanied by not more than four recent testimonials, to be sent to the undersigned not later than the Morning of Tuesday, the 14th inst.

F. KELLY, Clerk for the Trustees.

Town and Harbour Offices, Maryport, April 1, 1891.

WANTED, a small Oxide of Iron PURIFIER, with Wood or Iron Grids.

State size and price to WM. BROTHERS, Carbonate and Liquor Ammonia Manufacturer, Rawtenstall, LANCASHIRE.

WANTED, to purchase Gas Carbon delivered at nearest Station to Gas-Works, in quantities of not less than 4 tons.
Address stating price per ton and quantity, No. 1766, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Second-hand Centre-Valve (8-inch, 10-inch, or 12-inch) for four Purifiers.
Address, with full particulars, the MANAGER, Gas-Works, PEMBROKE DOCK.

FOR SALE.—A Patent Four-Blade Exhauster, to pass 100,000 cubic feet per hour. In use only Two months (not for Gas), and equal to new, at G. WALLER AND CO.'s, Park Street, SOUTHWARK, S.E.

FOR SALE—Two Purifiers, 10 feet. by 8 feet; one PURIFIER, 8 ft. by 6 ft. by 3 ft. 6 in. deep, with covers; 8-inch CENTRE-VALVE and CONNECTION, LIFTING APPARATUS, &c.; also one 6-inch GOVERNOR. All in good condition.
The above can be seen at the Market Harborough Gas-Works.
F. ARMITAGE,
Engineer.

FOR SALE—Four Purifiers in a Group, 16 ft. by 12 ft. by 3 ft. 9 in. deep; 12-inch Centre-Valve and Connections. Would erect, and make practically equal to new.
Inquiries invited for various second-hand Gas Plant: Gasholders, Tanks, Purifiers, Washers, Exhausters, Station Meters, &c.
Apply to SAML. WHILE (late Ashmore and While), 60, Queen Victoria Street, LONDON, E.C.

CORPORATION OF BLACKPOOL.

TENDERS FOR IRONWORK.

THE Gas Committee are prepared to receive TENDERS for the IRONWORK for 108 Retorts complete, including Stage Floor, &c.
Tenders to be sent in, addressed to the Chairman, by the morning of the 13th of April.
Plans and specifications may be seen at the Office of the undersigned.
JOHN CHEW,
Gas Engineer.
Gas Office, Blackpool,
April 2, 1891.

COAL CONTRACT.

THE Gas Commissioners of the Burgh of Dumfries will receive OFFERS for the supply of about 5000 tons of CANNEL COAL.
Delivery, as required by the Manager, between the 15th of May, 1891, and the 15th of May, 1892. Carriage paid to Dumfries Station.
Endorsed tenders to be lodged with John Grierson, Esq., Town Clerk, Dumfries, on or before the 18th current.
The Gas Commissioners will not bind themselves to accept the lowest or any tender.
Town Hall, Dumfries,
April 3, 1891.

TENDERS FOR GAS COAL.

THE Corporation of Droitwich invite TENDERS for the supply of about 1000 tons of best screened GAS COAL, at per ton of 21 cwt., to be delivered free at Droitwich (G. W.) Railway Station at such times and in such quantities as may be required.
The contract will be for one year, commencing on the 1st prox.
Tenders (with analysis of the Coal to be supplied), properly endorsed "Tender for Gas Coal," to be sent to the undersigned on or before the 24th inst.
The Corporation do not bind themselves to accept the lowest or any tender.
S. JOHN TOMBS, Town Clerk.
Droitwich, April 3, 1891.

LIVERPOOL UNITED GASLIGHT COMPANY.

THE Directors of the Liverpool United Gaslight Company are prepared to receive TENDERS for the supply of 100,000 tons of CANNEL and 200,000 tons of COAL, to be delivered at the various Works of the Company, during the period of Twelve Months between the 1st of July, 1891, and the 30th of June, 1892.
Tenders will be received for the whole or any portion of the above quantity.
The Directors reserve the right to accept tenders for the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any tender.
Full particulars and printed forms of tender can be obtained on application to the undersigned, at the Gas Office, Duke Street, Liverpool, to whom tenders (on the printed form) must be sent on or before Tuesday, April 28, 1891, endorsed "Tender for Coal."
By order,
WILLIAM KING, Engineer.
Gas Office, Duke Street, Liverpool,
April 2, 1891.

TO GAS ENGINEERS.

THE Directors of the Ossett Gas Company invite TENDERS for Four PURIFIERS, each 18 ft. by 17 ft. by 5 ft. deep.
Plans and specifications may be seen at the Offices of the Company from Ten to Four p.m.
Tenders to be sent in on or before Wednesday, the 22nd of April, 1891, and endorsed "Tender for Purifiers."
By order,
JAS. CASTLE, Secretary.

BOROUGH OF MACCLESFIELD.

THE Gas Committee have for disposal 300 TWO-LIGHT METERS, and are prepared to receive TENDERS for the same, which can be seen at their Gas-Works, Macclesfield.
Tenders to be sent to the Town Hall not later than Saturday, the 18th of April, 1891.
W. FREDK. TAYLOR,
Town Clerk.

COLNE AND MARSDEN LOCAL BOARD.

TENDERS FOR TAR AND LIQUOR.

THE Gas Committee invite Tenders for their SURPLUS TAR and LIQUOR produced at these Works during the year ending March 25, 1892.
Particulars from the Engineer, to whom tenders must be sent on or before April 20.
HY. SIMMONDS,
Engineer.
Gas-Works, Colne,
March 26, 1891.

RAMSGATE CORPORATION GAS AND WATER DEPARTMENT.

EXTENSION OF GAS-WORKS.

TENDERS are invited for the necessary BRICKWORK in connection with above, to be sent in, addressed to the Chairman of the Gas and Water Committee, not later than Monday, April 13, endorsed "Brickwork."
Particulars on application to
WILLIAM A. VALON,
Engineer.

RAMSGATE CORPORATION GAS AND WATER DEPARTMENT.

THE Gas and Water Committee desire TENDERS for the supply of a new STEEL BOILER, 27 feet long and 7 feet in diameter. Lancashire type.
Tenders to be sent in on or before Noon on Monday, April 13, addressed to the Chairman of the Gas and Water Accounts Committee, and endorsed "Tender for Boiler."
The Committee do not bind themselves to accept the lowest or any tender.
Full particulars on application to
WILLIAM A. VALON,
Engineer.

FALMOUTH GAS COMPANY.

TO GAS APPARATUS MAKERS.

THE Directors of the above Company are prepared to receive TENDERS for the supply and erection of four new PURIFIERS, 12 feet square by 5 feet deep, with Centre-Valve and Connections; also for CAST-IRON COLUMNS and WROUGHT-IRON GIRDERS for carrying the Purifiers overhead.
Drawings and specifications may be seen at the Gas-Works, or tracing and copy of specification will be forwarded, on receipt of One Guinea, by the undersigned.
Tenders, marked "Purifiers, &c.," must be sent in not later than Monday, the 20th of April, 1891.
The Directors do not bind themselves to accept any tender.
JOSEPH WM. BUCKLEY,
Engineer and Manager.
Gas-Works, Falmouth,
April 1, 1891.

LEIGH LOCAL BOARD.

THE Gas Committee of the Leigh Local Board invite TENDERS for the supply and delivery of the following:—
No. 1.—Station meter, to pass 50,000 cubic feet per hour.
No. 2.—Rotary Exhauster and Engine combined, to pass 40,000 cubic feet per hour.
No. 3.—One hundred (100) tons of Oxide of Iron for purification.
No. 4.—Two hundred and eighty-five (285) feet of 21 in. by 15 in. Machine-made Retorts, and a quantity of Fire Bricks and Clay.
All particulars may be had from the undersigned.
Sealed tenders, endorsed, and addressed to Jas. Thorp, Esq., Chairman, to be delivered at the Town Hall, Leigh, not later than Monday, the 20th of April next.
The lowest or any tender not necessarily accepted.
ALFRED T. FLETCHER,
Engineer and Manager.
Gas-Works, Leigh, Lancs.,
March 30, 1891.

TAR FOR SALE.

TENDERS wanted for the purchase of TAR for Twelve Months, delivered on Rail at Willington Quay Railway Station and Walker Railway Station. Total quantity about 130,000 gallons.
Tenders to be addressed to Frank Carr, Secretary, Walker and Wallsend Union Gas Company, Walker-on-Tyne, on or before Thursday, the 9th of April.

HAWICK GASLIGHT COMPANY, N.B.

THE Directors of the above Company invite TENDERS for the purchase of TAR and AMMONIACAL LIQUOR produced at their Works for One or Three years, or such other period as may be agreed upon, from the 1st of June, 1891.
Offers, stating price per ton of 20 cwt. delivered into Contractor's Tank-Wagons at the Gas-Works, to be lodged with George Grier, Esq., Secretary to the Company, on or before the 22nd day of April.
Further information may be obtained on application to J. SMITH, Manager.

BOROUGH OF WARRINGTON.

TENDERS FOR TAR.

THE Gas Committee invite Tenders for the purchase of TAR at their Works for One, Two, or Three years; the weight being about 1200 tons.
Particulars and conditions of contract will be forwarded on application to the undersigned.
Tenders, endorsed "Tender for Tar," and addressed to the Chairman of the Gas Committee, to be sent in not later than the 16th inst.
The Committee do not bind themselves to accept the lowest or any tender.
FREDK. TAYLOR, Secretary.
Gas Offices, Warrington,
April 2, 1891.

LEEDS CORPORATION GAS DEPARTMENT.

TENDERS required as below:—
For Turned and Bored and other Pipes, Bends, Tees, Syphon Wells, and other Irregular Pipes.
For Brass Main-Cocks.
For 2½, 3, and 4 inch Self-faced Bradford or Halifax Flags.
For Craven or Derbyshire Lime.
For Retort Mouthpieces, Stand-Pipes, Door-Frames, Special Bends, Tees, Flange Pipes, &c.
For Wrought-Iron Tubes.
Samples may be seen on application at the Stores Department, 21, Dewsbury Road; and forms of tender and specification may be had on application to Mr. Lupton, at the Offices of the Gas Department, Municipal Buildings.
Sample bundles of tubes to be sent as directed on form of tender.
Endorsed tenders, addressed to the Chairman, will be received not later than Wednesday, the 15th inst.; and no tender will be considered except on the form provided.
The lowest or any tender will not necessarily be accepted.

CRAYS GAS COMPANY.

SALE BY TENDER OF 120 £10 SHARES.

IN pursuance of the Crays Gas Order, 1884, Notice is hereby given that it is the intention of the Directors of this Company TO SELL BY TENDER 120 SHARES of the nominal value of £10 each.
Forms of tender, and further particulars, may be obtained on application at the Offices of the Company.
Sealed tenders must be sent to the undersigned not later than Five o'clock in the afternoon, on Tuesday, the 7th of April, 1891.
By order,
FRANCIS M. EDWARDS,
Secretary.
Offices: The Gas-Works,
St. Mary Cray, Kent,
March 17, 1891.

GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.

NOTICE is hereby given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Shareholders of the above Company will be held at the Offices of the Company, 30, Gracechurch Street, in the City of London, on Tuesday, the 19th day of May next, at Three o'clock in the afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 31st day of December last, to declare a Dividend, to elect Directors and an Auditor in the place of those retiring by rotation, and to transact the General Business of the Company.
The Transfer Books will be closed from the 6th to the 19th prox., both inclusive.
By order of the Board,
ALFRED LASS, Secretary.
Offices: 30, Gracechurch Street,
London, March 24, 1891.

FOR GENERAL DISTRIBUTION.

A 4pp. Leaflet, entitled "Oil or Gas for LIGHTING OUR HOMES?" Price 5s. per 100; £2 per 1000. Larger quantities by agreement. Specimen copy, by post 1½d.
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TENDERS FOR LIGHTING BY GAS THE CITY OF PERNAMBUCO, UNITED STATES OF BRAZIL.

NOTICE is hereby given, that Tenders for the above service will be received, on or before the 18th of May next, at the Offices of the Secretary to the Governor of the State of Pernambuco (Secretaria do Governo do Estado de Pernambuco).

A copy of particulars published by order of His Excellency the Governor of the said State can be had on application to the BRAZILIAN LEGATION, 35, Piccadilly, LONDON; or to the BRAZILIAN CONSUL-GENERAL, 6, Great Winchester Street, LONDON, E.C.

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TO BE HELD AT

THE VICTORIA HALL, EXETER,

ON APRIL 28 to MAY 1.

INVENTORS who have Models or Plans of any APPARATUS connected with the Manufacture of Gas will kindly communicate with the undersigned on or before the 14th inst.

Care will be taken to avoid any damage, and carriage will be paid both ways.

W. A. PADFIELD.

Gas Offices, 248, High Street, Exeter.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

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CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

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Put on Rail at 5s. 6d. per ton.

Yield of gas per ton	8200 feet.
Illuminating power	20·50 sperm candles.
Ammoniacal liquor per ton	120 lbs.
Tar per ton	60 lbs.

A trial order for not less than ten Wagons from any Corporation or Gas Company before purchasing the lot will be accepted at the above price.

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BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

MIRFIELD, NORMANTON.

NEWBATTLE CANNEL.

QUOTATIONS ON APPLICATION TO

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LIMITED,

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CAST-IRON PIPES

FOR GAS AND WATER.

Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

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FOR GAS, WATER, AND STEAM.

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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
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BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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MANUFACTURERS OF
FILES OF BEST QUALITY
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STEEL OF ALL DESCRIPTIONS.
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HOLMSIDE GAS COALS.
(Wrought out of Holmside and South Moor Collieries.)

PRESENT production nearly 3000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¼ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves 69 per cent. of excellent Coke. During the year 1890, the London Gas Companies carbonized about 400,000 tons of HOLMSIDE COALS. They are used by The Gaslight and Coke Company, the South Metropolitan Gas Company, the Woolwich (Government) Gas-Works, the Newcastle and Gateshead Gas Company, the European Gas Company, L'Union des Gaz, and by many other Gas Companies both at Home and Abroad.

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MANUFACTURER OF SULPHURIC ACID
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TAR, LIQUOR, AND SPENT OXIDE
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THE BEST AND SIMPLEST SYSTEM
VALVES FOR PURIFIERS
Is Weck's Patent arrangement of Three-Way Disc Valves, either separate for Purifiers fixed in line, or arranged together as a
CENTRE-VALVE
When the Purifiers are fixed in square.
No Leakage. No Foul Gas passed in changing. All the Purifiers in action, or any less number. Clean Box emptied of Air before taking into use.

DESCRIPTIVE PAMPHLET ON APPLICATION.

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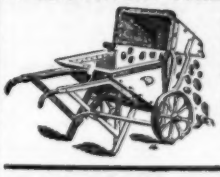

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TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·2 candles.
Coke	70 per cent.

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"PHŒNIX WASHER"
The Divisions in the Revolving Discs are filled with
"WOODEN CLUSTERS"
(As patented by them in 1883).
Also tubes for raising and distributing Liquor over the Clusters.
Efficient in action and small driving power.
Patent four-blade exhausters to pass from 50,000 to 500,000 feet per hour.
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EXISTING EXHAUSTERS ALTERED TO PASS AN INCREASE OF 30 TO 50 PER CENT.
Using the same Valves, Connections, and Driving Power.
FRICTION 25 PER CENT. LESS THAN OTHER EXHAUSTERS.
THE DELIVERY OF GAS BEING MORE DIVIDED EACH REVOLUTION, THE GAUGE IS MORE STEADY.
Model of Four or Three Blade Exhauster on application.
BEALE EXHAUSTERS FOR 300 WORKS.
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AND AT STROUD, GLOUCESTERSHIRE.

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VARIOUS SIZES *ALWAYS IN STOCK.*

Flanges made to suit requirements.

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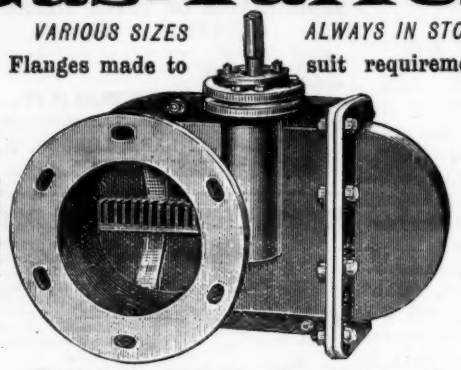

FOUR-WAY VALVES.

FLANGED RACK AND PINION VALVE.

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Specialities in CARBONIZING PLANT.

GENERATOR AND REGENERATOR FURNACES.

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ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.

Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

Telegrams: "ATLAS SHEFFIELD."

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S PATENTS

All Spent Limes are most effectually, economically, and continuously recovered, and at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it. Descriptive Pamphlet and Terms from Agents as under.

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Hislop's Patent Producer and Patent Charging Appliances offer advantages which are unapproachable, while in every other detail his Settings are confidently recommended as being the most inexpensive and effective possible.

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FIRE BRICKS,

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Special Bricks for Intense Heats.

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CASTINGS AND EVERY REQUISITE FOR GAS-WORKS.

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HUNDREDS OF SETTINGS WORKING EMINENTLY SATISFACTORY.

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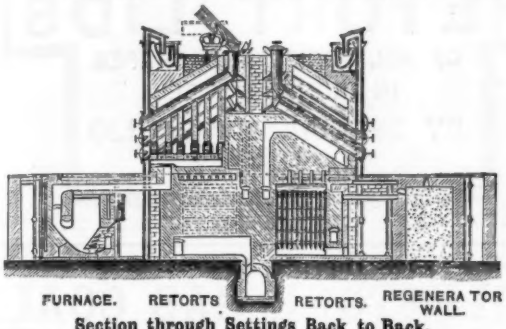
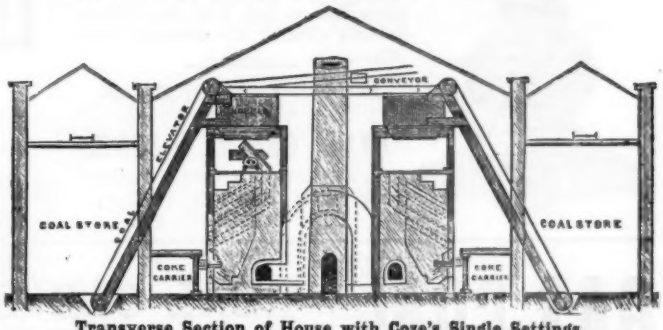
AUTOMATIC SYSTEM OF CHARGING & DRAWING INCLINED GAS-RETORTS.

Gold Medal, Paris Exhibition, 1889.

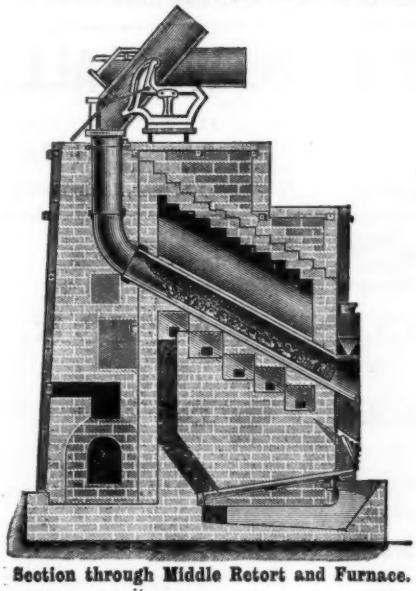
This System of Automatically Charging and Discharging Retorts without machinery or arduous labour is in operation at several places on the Continent and in America, and will shortly be at work in various Gas-Works in England.



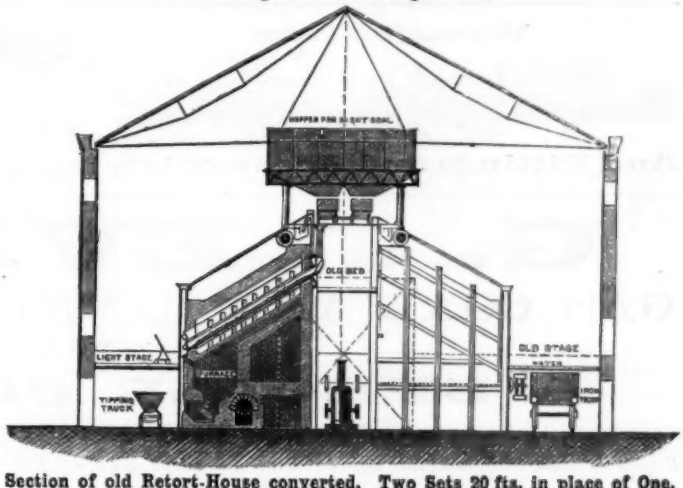
Section through Settings Back to Back.
Working off ground floor with Generator under Stage and Regenerator under the Sets.



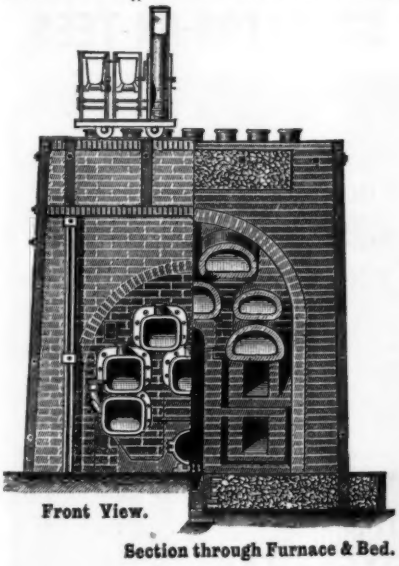
Transverse Section of House with Coze's Single Settings,
Showing Method of working Two Single Settings and Distributing the Coal to the Supply Hoppers; the whole of the work being Automatic.
This plan is for a large House.



Section through Middle Retort and Furnace.

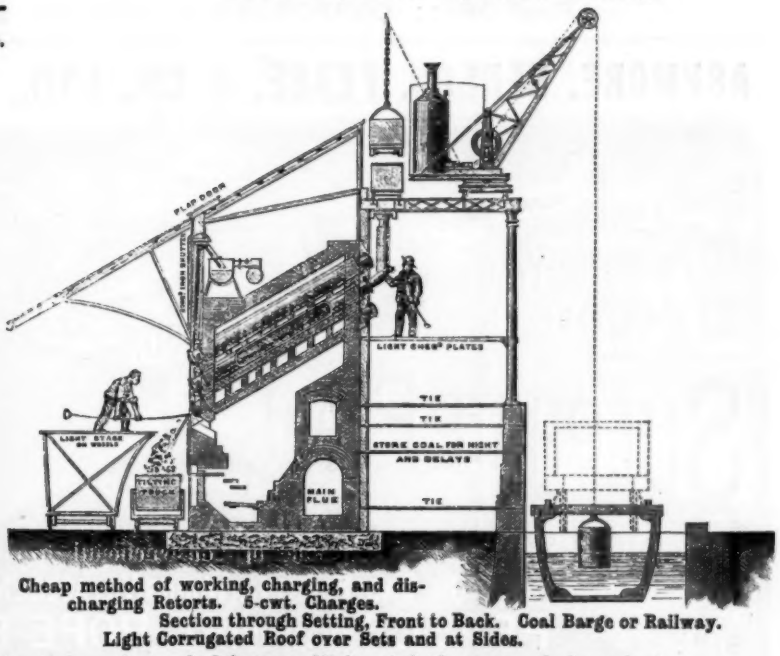


Section of old Retort-House converted, Two Sets 20 fts. in place of One.
Modified form, with ordinary Retorts and Fittings.



Front View.

Section through Furnace & Bed.



Cheap method of working, charging, and discharging Retorts. 5-cwt. Charges.
Section through Setting, Front to Back. Coal Barge or Railway.
Light Corrugated Roof over Sets and at Sides.

These Systems are fully Patented, and any Infringer will be strictly proceeded against.

For further particulars apply to W. M. KIGHT, Secretary of THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86 and 88A, LEADENHALL STREET, LONDON, E.C.

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NEW HIGH-POWER GAS-LAMP.

Westphal's Patent.

Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

Particulars and Prices Free.

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OF ALL FORMS AND SHAPES
IN IRON OR STEEL
BY SPECIAL HYDRAULIC
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Wrought-Iron

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A SPECIAL COMPOUND

FOR THE CURE OF STOPPED ASCENSION-PIPES,

A couple of charges of which will clear a stopped pipe, and an occasional charge keeps them clean, and also increases the make per ton and the illuminating power.

PRICE AND PARTICULARS ON APPLICATION.

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SIMPLE IN CONSTRUCTION EFFECTIVE IN RESULTS
MAKERS OF LARGEST GAS HOLDER IN THE WORLD
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ECONOMICAL IN COST & SPACE
STILLS IN STOCK 2 3 & 4 FEET DIA.
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OIL GAS PLANT FOR WORKS VILLAGES & MANSIONS
PEASE'S Patent WIRE ROPE SYSTEM
for Guiding Gasholders. Effecting a Saving of 25 per cent in Cost

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GAS ENGINEERS,

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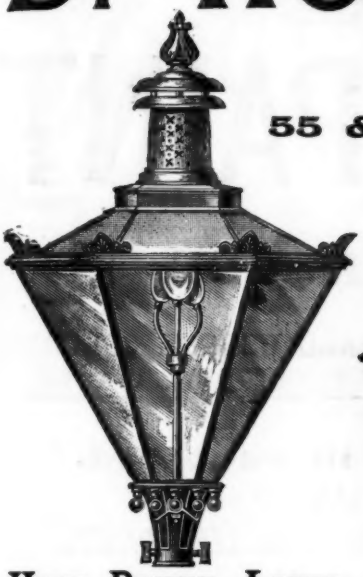
Manufacturers of every description of Gas-Fittings.



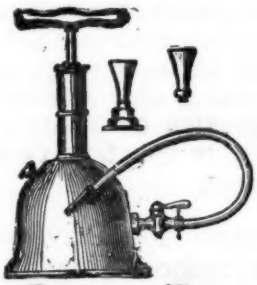
HIGH-POWER LAMPS

Of every description, fitted with Copper Tops, Porcelain Cones, and Regulating High-Power Burners.

HULETT'S PATENT

STREET LAMPS.

No putty required.
Glass secured by hinged clips. No loose parts.
A new pane of glass can be fitted in a few minutes by any inexperienced person.
Glass can be supplied cut ready for use.
The frames are not liable to be damaged as in ordinary lamps when hacking out a broken pane of glass.
The glass can be removed for repainting.
Several thousands of these are now in use, giving general satisfaction.
They are strongly made, and of the best material.



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For Removal of Obstructions in Gas Service Pipes.

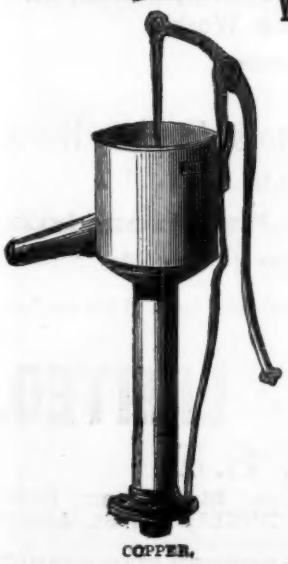
They are constructed with Air Vessels of great strength and capacity for storing a large quantity of air, which can be delivered at a pressure of 150 lbs. if necessary.

They are also fitted with Water Fittings, so that about a gallon of liquid can be discharged with the air, for removing Naphthalene from the interior of tubes.

WET AND DRY GAS-METERS.

GAS PRESSURE GAUGES.

WROUGHT OR CAST IRON TUBES AND FITTINGS.



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In Iron, Brass, and Copper.

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CAST-IRON SYPHONS FOR MAINS.

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CRADLES AND BRACKETS.

— PRICE LISTS UPON APPLICATION. —

BELL'S ASBESTOS AQUOL PAINT

IS MADE READY FOR USE.

IS FIRE RESISTING.
IS WASHABLE.
IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY **40** PER CENT. GREATER THAN LEAD PAINTS.

For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

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Those who Study Economy and Protection from Fire should use only

BELL'S ASBESTOS AQUOL PAINT.

BELL'S ASBESTOS AQUOL PRIMING is made Ready for Use.
BELL'S ASBESTOS AQUOL PRIMING stops all suction of Wood, Cement, Plaster, &c.
BELL'S ASBESTOS AQUOL PRIMING should be applied to all New Work.

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AN EXCELLENT CURE FOR DAMP WALLS.

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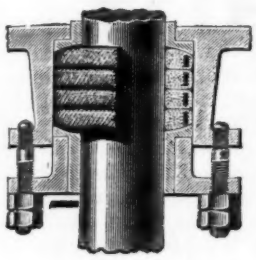
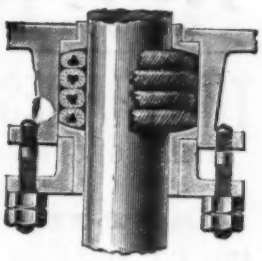


ROUND



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Under this registered title are included the inventions of Mr. Field; and experience has proved them to be the MOST EFFICIENT DURABLE, and ECONOMICAL PACKINGS ever made. They constitute such a combination of Asbestos and India-rubber as secures the maximum of elasticity and heat resistance; and they are, therefore, UNEQUALLED FOR EVERY KIND OF ENGINE. These Packings are being universally used by most of the leading Steamship Companies throughout the world for ordinary Compound, Triple, and Quadruple Expansion Engines of the latest types. The packings are composed of rolled Asbestos Cloth, but the India-rubber is placed in two forms to suit various cases.

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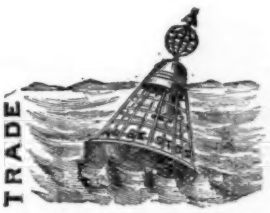

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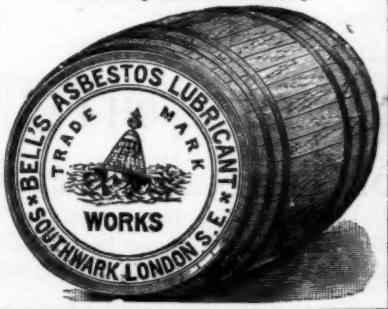
BELL'S ASBESTOS
YARN AND SOAPSTONE PACKING
BEST LOCOMOTIVE PACKING made.

BELL'S
COMPOUND HYDRAULIC PACKING
Is specially suited for
Hydraulic Machinery, Accumulators and Ammonia and all Pumps.

BELL'S ASBESTOS LUBRICANT
Is unequalled
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.



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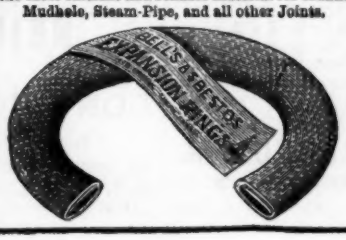
The reputation of this Lubricant is based on the experience of thousands of users, which places it far in advance of those who rely only on mere laboratory tests.

ASBESTOLINE IS THE CHEAPEST MOST EFFICIENT, CLEANEST MOST INODOROUS AND SAFEST LUBRICANT.

ASBESTOLINE HAS SAVED 90 PER CENT. OVER OIL.

Has been used for all purposes, AND BEATEN ALL OTHER LUBRICANTS IN ACTUAL WORK.

BELL'S ASBESTOS
EXPANSION SHEETING
RINGS, AND TAPE.
Is the most efficient and reliable Material for Manhole, Mudhole, Steam-Pipe, and all other Joints.

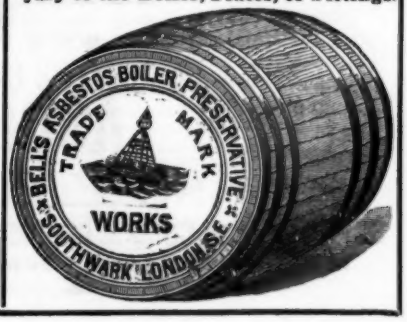


BELL'S ASBESTOS
NON-CONDUCTING COMPOSITION.
Will reduce loss by radiation and save 40 per cent. of fuel.
Is superior to any other, and saves its cost in a few months.

Can be applied again after many years' service. Is sent out dry in bags; therefore cheaper than others sent out wet.

ALL BAGS ARE MARKED AS ABOVE.

BELL'S ASBESTOS
BOILER PRESERVATIVE
Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings.



HENRY BALFOUR & CO.,

LEVEN, FIFE,

MAKERS OF

GASHOLDERS

And all Classes of GAS PLANT,

REVOLVING BRUSH SCRUBBERS, FOUR-WAY VALVES.

LONDON: 13, BILLITER STREET, E.C.

THE THAMES BANK IRON CO.

UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS,

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of **LYON'S 'PATENT' GAS MAIN SYPHONS.**

AGENTS FOR

ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,
Near LEEDS

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

S. PONTIFEX & CO.,

GAS and WATER ENGINEERS,

Manufacturers of and Contractors for the Maintenance of

PUBLIC LAMPS & LANTERNS;

GLASS—Flint Opal, and Bent in Stock, and Cut to Sizes

WELL LAMPS, STREET NAME TABLETS,

LAMP COLOUMNS, HEAD IRONS, PUTTYLESS LAMPS,

LANTERNS COCKS, REGULATORS,

Improved High-Power Lanterns for Lighting Street Refuges and Open spaces.

BROWN'S PATENT

LAMPLIGHTERS' TORCHES.

PROPRIETORS AND MANUFACTURERS OF

BOX'S PATENT

PUTTYLESS STREET LAMP.

This Lamp may be supplied fitted with clear opal, or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing Lamps to this system can be supplied at moderate prices.

S. PONTIFEX & CO., 22, COLEMAN ST., LONDON.

Works: 18, STEPHEN STREET, TOTTENHAM COURT ROAD, W.

MEIKLEJOHN'S

Patent

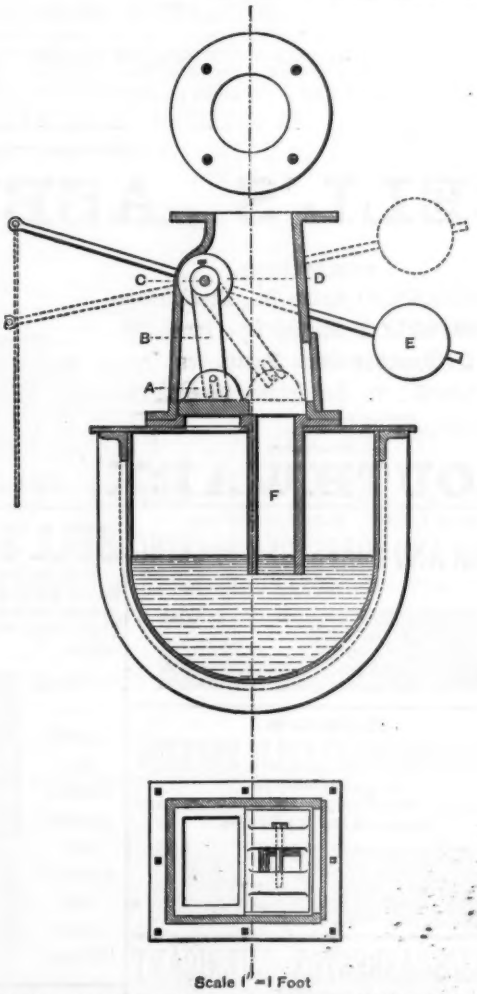
IMPROVED SLIDE-VALVE ANTI-DIP.

MR. THOS. NEWBIGGING'S REPORT.

5, Norfolk Street, Manchester, Dec. 11, 1889.

SIR,—I have examined your patent Anti-Dip arrangement, and have seen it at work on the Retort-Benches, at the Longwood Gas-Works, and the opinion which I have formed of its simplicity and certainty in working is distinctly favourable; so much so *that I consider it to be, without exception, the most efficient Appliance of the kind which has yet been introduced.* It can be applied to existing Benches with great ease, and at a minimum cost. So far as I am aware, it embodies a principle of action not previously applied in this direction.—Yours truly,

THOS. NEWBIGGING.



Scale 1"=1 Foot

Is perfectly reliable in action, and requires no attention.
Has all the advantages of the Dip and Anti-Dip combined.
Is cheap, and easily fixed to any form of main.
Will more than save their cost in one season's working.

Further particulars from the Sole Patentee and Manufacturer

NEILL MEIKLEJOHN,

GAS ENGINEER,

LONGWOOD, HUDDERSFIELD.

*** During the serious illness of Mr. Neill Meiklejohn, all communications as to the above should be addressed to C. Meiklejohn, Gas Engineer, Oldbury, near Birmingham.

PATENT RIVET COMPANY, LTD., SMETHWICK, NEAR BIRMINGHAM.

BOLTS & NUTS FOR PIPE JOINTS, FLANGE JOINTS, RETORT MOUTH-PIECES, SCRUBBERS, CONDENSERS, PURIFIERS, SIEVES, TANKS, ENGINES, BOILERS, &c., &c.

Established 1843.

TELEGRAMS: "PRIVET, BIRMINGHAM."

MANUFACTURERS OF

RIVETS FOR GASHOLDERS, BOILERS, GIRDERS, TANKS, COVERS, &c., &c.; ALSO SET SCREWS, WASHERS, SPIKES, AND FISH PLATE BOLTS.

ALDER AND MACKAY,

MANUFACTURERS OF

IMPROVED WET AND DRY GAS-METERS

IN CAST-IRON AND TIN CASES OF THE HIGHEST EXCELLENCE.

ORIGINAL MANUFACTURERS OF DRY METERS IN CAST-IRON CASES.

STATION METERS, EXPERIMENTAL METERS, PHOTOMETERS, & PRESSURE-GAUGES, &c.

Results of Tests of Dry Gas-Meters (Section III.) of the Glasgow Philosophical Society's Gas Exhibition, as per London "Gas Journal," May 10, 1881.

	ALDER & MACKAY.	W. & B. COWAN.	G. GLOVER & Co.	JAMES KEITH.	D. B. PEEBLES & Co.
Total of Fast Tests . .	47·2 ...	6·9 ...	33·6 ...	62·3 ...	53·7
Total of Slow Tests . .	25·3 ...	117·4 ...	43·1 ...	31·4 ...	38·5
	72·5 ...	124·3 ...	76·7 ...	93·7 ...	92·2

SOLE AGENTS FOR THE "SENTINEL" GAS GOVERNOR IN SCOTLAND AND IRELAND.

Descriptive Circulars, Price Lists, and Full Particulars forwarded on application.

GRANGE WORKS, EDINBURGH.

THE HORSELEY CO., LTD., TIPTON, STAFFORDSHIRE,

MAKERS OF

GAS HOLDERS & GAS PLANT,

PURIFIERS, SCRUBBERS, CONDENSERS, WASHERS, TANKS, VALVES,

PIPES, LAMP PILLARS, RETORT-FITTINGS, ETC.

ALSO ALL KINDS OF

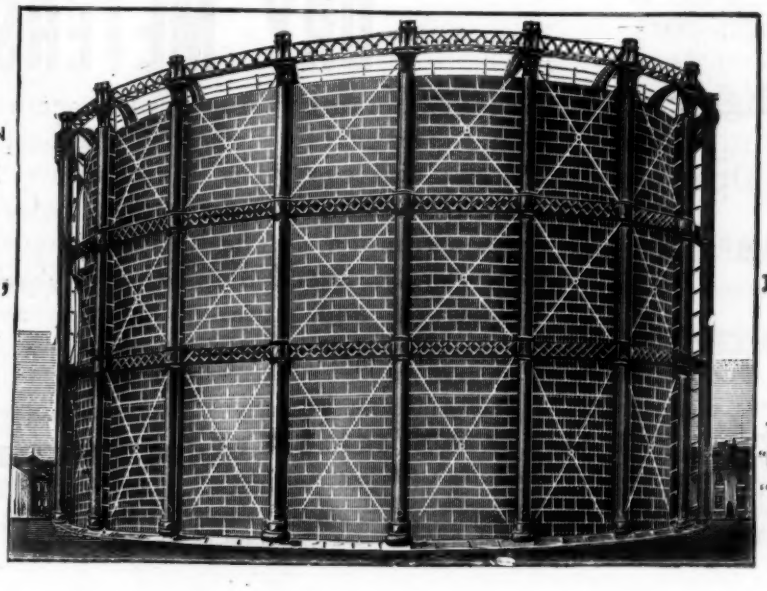
STRUCTURAL IRON

AND STEEL WORK,

BRIDGES,

ROOFS,

PIERS, ETC.



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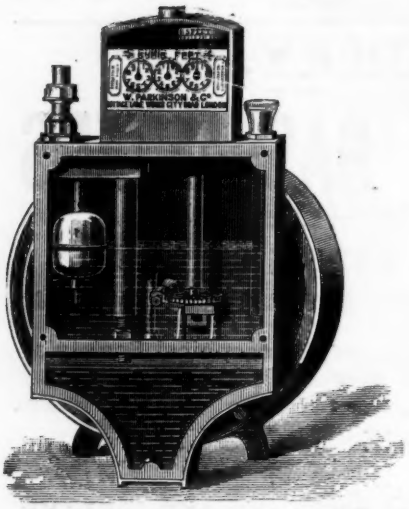
"HORSELEY, TIPTON."

"GALILEO, LONDON."

W. PARKINSON & Co.

— ESTABLISHED 1816 —

THE ORIGINAL MANUFACTURERS OF WET METERS.



ORDINARY WET METERS

IN CAST-IRON CASES.

Work with very little friction. Will stand very high pressures. Cannot possibly be shut off by sudden increase of pressure, the Float being affected by Outlet Gas only. Allow for loss of water by evaporation without materially affecting the registration or shutting off the gas. Unexcelled for simplicity of construction, excellence of workmanship, or accuracy in registration.

COMPENSATING METERS

IN TINNED OR CAST-IRON CASES.

The Slow-Spoon Compensator has been in extensive use for many years; it maintains an unvarying water-line without appreciable friction, and provides a large reserve of water. The Float arrangement allows sudden or excessive pressure on the Inlet without affecting the working of the Meter or extinguishing the Lights.

DRY METERS.

These Meters are unsurpassed for accuracy of registration. The cases are made of the best Charcoal Tin Plates; and each part of the Meter is stamped by special Machinery to ensure uniformity and exactness in construction. The Diaphragms are all of the best Persian Sheep Skins, carefully selected, and the brasswork and smaller fittings are of superior workmanship.

COTTAGE LANE WORKS, CITY ROAD,
LONDON.
Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS,
BIRMINGHAM.
Telegraphic Address: "GAS-METERS."

OFFICE: 10, MAWSON'S CHAMBERS, DEANSGATE,
MANCHESTER.
Telegraphic Address: "PRECISION."
[See also Advt., p. 634.

London: Printed by WALTER KING (at the office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, April 7, 1891.